EXHIBIT G

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571-272-7822

Paper 51
Entered: November 4, 2021

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

APPLE INC.,
Petitioner,

v.

COREPHOTONICS, LTD.,
Patent Owner.

IPR2020-00860
Patent 10,326,942 B2

Before BRYAN F. MOORE, MONICA S. ULLAGADDI, and JOHN R. KENNY, *Administrative Patent Judges.*

ULLAGADDI, *Administrative Patent Judge.*

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

Apple Inc. ("Petitioner") filed a Petition to institute an *inter partes* review of claims 1–25 ("the challenged claims") of U.S. Patent No. 10,326,942 B2 (Ex. 1001, "the '942 patent"). Paper 2 ("Pet."). Corephotonics, Ltd. ("Patent Owner") filed a Preliminary Response. Paper 6.

After institution, Patent Owner filed a Patent Owner Response (Paper 10, "PO Resp."), Petitioner filed a Reply to Patent Owner's Response (Paper 19 "Pet. Reply"), and Patent Owner filed a Sur-Reply (Paper 28, "PO Sur-Reply").[1] An oral hearing was held on August 5, 2021, and a copy of the transcript was entered in the record. Paper 47 ("Tr."); Paper 48 (Conf. Tr.").

We have jurisdiction pursuant to 35 U.S.C. § 6. This Decision is a Final Written Decision under 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73 as to the patentability of the claims on which we instituted trial. Having reviewed the arguments and the supporting evidence, we determine that Petitioner has shown, by a preponderance of the evidence, that claims 1–25 of the '942 patent are unpatentable.

[1] We refer to the confidential, non-public versions of these briefs. The non-confidential, public version of Patent Owner's Response is Paper 42 and the non-confidential, public version of Petitioner's Reply is Paper 38. Although the paper numbers differ between non-confidential and confidential versions of the briefs, the page, column, and/or line number references should be the same.

II. BACKGROUND

A. Related Proceedings

Petitioner and Patent Owner identify the following district court proceeding: *Corephotonics, Ltd. v. Apple Inc.*, Case No. 5:19-cv-04809 (N.D. Cal.). Pet. 1; Paper 5, 1.[2]

We identify the following related administrative matters, including every application and patent claiming the benefit of the priority of the filing date of patents in the priority chain of the '942 patent. *See* Office Consolidated Trial Practice Guide[3] at 18; *see also* 84 Fed. Reg. 64,280 (Nov. 21, 2019).

The '942 patent is a continuation of Application No. 15/424,853 (now U.S. Patent No. 10,015,408, "the '408 patent"), which is a continuation of Application No. 14/880,251 (now U.S. Patent No. 9,661,233, "the '233 patent"), which is a continuation of Application No. 14/365,711 (now U.S. Patent No. 9,185,291, "the '291 patent"). Ex. 1001, code (63).

Further, U.S. Patent Nos. 10,225,479, 10,904,444, and 10,841,500 claim priority to the '942 patent. The following proceedings challenge patents in the priority chain of the '942 patent:

IPR2018-01348 (claims 1–7, 10, 12, and 13 of the '291 patent, institution denied);

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[2] Patent Owner cites *Corephotonics, Ltd. v. Apple Inc.*, Case No. 3:19-cv-04809-LHK (N.D. Cal.) (Paper 5, 1), but this case number appears to reflect a typographical error. A PACER search of Case No. 5:19-cv-04809 reveals that Patent Owner's complaint in that case was erroneously identified as "Civil Action No. 3:19-cv-4809" on its cover page.

[3] Available at https://www.uspto.gov/TrialPracticeGuideConsolidated.

IPR2020-00487 (claims 1–18 of the '233 patent, institution denied, rehearing granted and subsequently instituted, pending final written decision);

IPR2020-00488 (claims 1–4 and 7 of the '408 patent, institution denied);

IPR2020-00489 (determining claims 5 and 6 of the '408 patent not shown to be unpatentable, Petitioner requested rehearing (Paper 33) and a Precedential Opinion Panel (POP) Request (Papers 37, 38)—neither is decided as of the entry of this Decision);

IPR2020-00905 (challenges claims 1–16, 18, 23–38, and 40 of the '479 patent, instituted, pending final written decision); and

IPR2020-00906 (challenges claims 19–22 of the '479 patent, instituted, pending final written decision).

B. The '942 Patent

The '942 patent concerns a dual-aperture zoom digital camera that operates in both still and video modes. Ex. 1001, codes (54), (57). The camera includes a Wide sub-camera and a Tele sub-camera, each of which includes a fixed focal length lens, an image sensor, and an image signal processor. *Id.* at 3:34–37. Figure 1A, reproduced below, illustrates a dual-aperture zoom imaging system, also referred to as a digital camera in the '942 patent. *Id.* at 5:60–61, 6:18–20.

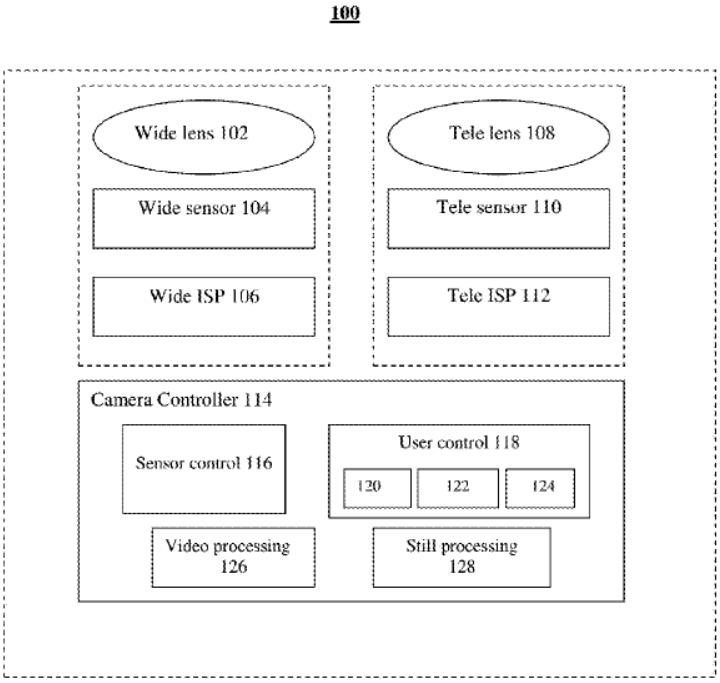


FIG. 1A

Figure 1A shows a dual-aperture zoom imaging system. *Id.*

In still mode, the '942 patent discloses performing zoom by either fully or partially fusing Wide and Tele images, in which a fused image includes information from both Wide and Tele images. *Id.* at 3:46–49. In video mode, however, the '942 patent discloses performing optical zoom by switching between Wide and Tele images, without fusion, in order "to shorten computation time requirements" and enable a high video rate. *Id.* at 3:53–56. The invention uses Wide sub-camera output for a low zoom factor (ZF) and Tele sub-camera output for a high ZF. *Id.* at 11:13–29.

Typically, a user sees a jump, or discontinuous image change, when the camera switches between sub-cameras or points of view. *Id.* at 10:37–39. The '942 patent addresses this issue by employing a "smooth transition," which "is a transition between cameras or POVs [Points of View] that minimizes the jump effect," and which "may include matching

the position, scale, brightness and color of the output image before and after the transition." *Id.* at 10:41–45. Because "an entire image position matching between the sub-camera outputs is in many cases impossible," a smooth transition may achieve position matching "only in the ROI [Region of Interest] region while scale brightness and color are matched for the entire output image area." *Id.* at 10:45–51. For zoom-in, "the output is a transformed Tele sub-camera output, where the transformation is performed by a global registration (GR) algorithm to achieve smooth transition." *Id.* at 11:13–18. For zoom-out, "the output is a shifted Wide camera output, where the Wide shift correction is performed by the GR algorithm to achieve smooth transition, i.e. with no jump in the ROI region." *Id.* at 11:20–25.

C. Challenged Claims

Petitioner challenges claims 1–25 of the '942 patent. Claims 1 and 19 are independent and are reproduced below.

> 1. A multiple aperture zoom digital camera, comprising:
>
> a) a Wide imaging section that includes a Wide sensor and a fixed focal length Wide lens with a Wide field of view (FOV), the Wide imaging section operative to output a Wide image;
>
> b) a Tele imaging section that includes a Tele sensor and a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV, the Tele imaging section operative to output a Tele image; and
>
> c) a camera controller operatively coupled to the Wide and Tele imaging sections and configured, when providing video output images, to:
>
> reduce an image jump effect seen in the video output images when switching from a Wide image to a Tele image by shifting the Tele image

relative to the Wide image according to a distance of an object in a Tele image region of interest (ROI), and/or

reduce an image jump effect seen in the video output images when switching from a Tele image to a Wide image by shifting the Wide image relative to the Tele image according to a distance of an object in a Wide image ROI.

19. A method for providing a digital video output in a multiple aperture zoom digital camera, comprising steps of:

a) providing a Wide imaging section that includes a Wide sensor and a fixed focal length Wide lens with a Wide field of view (FOV), the Wide imaging section operative to output a Wide image;

b) providing a Tele imaging section that includes a Tele sensor and a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV, the Tele imaging section operative to output a Tele image; and

c) when providing video output images, utilizing a camera controller operatively coupled to the Wide and Tele imaging sections to reduce an image jump effect seen in the video output images when switching from a Wide image to a Tele image by shifting the Tele image relative to the Wide image according to a distance of an object in a Tele image region of interest (ROI), and/or to reduce an image jump effect seen in the video output images when switching from a Tele image to a Wide image by shifting the Wide image relative to the Tele image according to a distance of an object in a Wide image ROI.

Ex. 1001, 13:23–44, 14:53–15:7.

D. Asserted Grounds of Unpatentability

Petitioner challenges claims 1–25 as follows. *See* Pet. 5.

Claims Challenged	35 U.S.C. §	Reference(s)/Basis
1, 2, 4, 19, 20, 22	103	Golan[4], Martin[5]
3, 21	103	Golan, Martin, Ahiska[6]
5, 23	103	Golan, Martin, Levey[7]
6–8, 24, 25	103	Golan, Martin, Parulski[8]
9, 12, 13, 18	103	Golan, Martin, Soga[9]
10, 14, 16	103	Golan, Martin, Soga, Baer[10]
11, 15, 17	103	Golan, Martin, Soga, Stein[11]

In support, Petitioner relies on the First and Second Declarations of Dr. Frédo Durand (Exs. 1003, 1040).[12] Patent Owner relies on the Declaration of Dr. Eli Saber (Ex. 2015).[13]

III. ANALYSIS

A. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

[4] U.S. Patent Application Publication No. 2012/0026366 A1, published Feb. 2, 2012 (Ex. 1005, "Golan").
[5] U.S. Patent No. 8,081,206 B2, issued Dec. 20, 2011 (Ex. 1006, "Martin").
[6] U.S. Patent No. 7,990,422 B2, issued Aug. 2, 2011 (Ex. 1007, "Ahiska").
[7] U.S. Patent Application Publication No. 2012/0019704 A1, published Jan. 26, 2012 (Ex. 1015, "Levey").
[8] U.S. Patent No. 7,859,588 B2, issued Dec. 28, 2010 (Ex. 1008, Parulski").
[9] Japanese Patent Application Publication No. 2007-259108A, published Oct. 4, 2007 (Ex. 1025, "Soga").
[10] U.S. Patent No. 7,112,774 B2, issued Sept. 26, 2006 (Ex. 1029, "Baer").
[11] U.S. Patent No. 8,908,041 B2, issued Dec. 9, 2014 (Ex. 1034, "Stein").
[12] We refer to the unredacted version of Exhibit 1040. The redacted version has the same exhibit numbers.
[13] We refer to the unredacted version of Exhibit 2015. The redacted version has the same exhibit numbers.

invention was made to a person having ordinary skill in the art to which said subject matter pertains. *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) when in evidence, objective evidence of nonobviousness, i.e., secondary considerations. *See Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

"In an [*inter partes* review], the petitioner has the burden from the onset to show with particularity why the patent it challenges is unpatentable." *Harmonic Inc. v. Avid Tech., Inc.*, 815 F.3d 1356, 1363 (Fed. Cir. 2016) (citing 35 U.S.C. § 312(a)(3) (requiring *inter partes* review petitions to identify "with particularity . . . the evidence that supports the grounds for the challenge to each claim")). The burden of persuasion never shifts to Patent Owner. *See Dynamic Drinkware, LLC v. Nat'l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015) (citing *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1326–27 (Fed. Cir. 2008)) (discussing the burden of proof in an *inter partes* review). Furthermore, Petitioner cannot satisfy its burden of proving obviousness by employing "mere conclusory statements." *In re Magnum Oil Tools Int'l, Ltd.*, 829 F.3d 1364, 1380 (Fed. Cir. 2016).

B. Level of Ordinary Skill in the Art

Petitioner contends that

> a Person of Ordinary Skill in the Art ("POSITA") at the time of the claimed invention would have a bachelor's degree or the equivalent degree in electrical and/or computer engineering, or a related field and 2–3 years of experience in imaging systems

> including optics and image processing. Furthermore, a person with less formal education but more experience, or more formal education but less experience, could have also met the relevant standard for a POSITA.

Pet. 3 (citing Ex. 1003 ¶ 17). Patent Owner states that, [f]or purposes of this proceeding, Patent Owner accepts Petitioner's definition of the level of ordinary skill." PO Resp. 6.

We determine the level of ordinary skill in the art proposed by Petitioner is consistent with the '942 patent and the asserted prior art. We apply Petitioner's definition in making the findings and conclusions rendered in this Decision.

C. Claim Construction

For *inter partes* reviews filed on or after November 13, 2018, we apply the same claim construction standard used by Article III federal courts and the (International Trade Commission) ITC, both of which follow *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), and its progeny. 37 C.F.R. § 42.100(b). Accordingly, we construe each challenged claim of the '942 patent to generally have "the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." *Id.*

1. "Reducing an Image Jump Effect"

Petitioner proposes a construction for one limitation, "reduce an image jump effect seen in video output images," as recited in claims 1, 2, and 19–21. Pet. 4–5. More particularly, Petitioner proposes to construe this limitation as "reduc[ing] a discontinuous image change in video output images." *Id.* at 4 (citing Ex. 1003 ¶¶ 39–41).

Patent Owner "adopts, for purposes of this IPR only, Petitioner's proposed construction for the phrase 'reduce [an/the] image jump effect seen in video output images.'" PO Resp. 7 (Ex. 2015 ¶¶ 33–36). We do not discern a dispute between the parties regarding this limitation, and we need not expressly construe this limitation to resolve the controversy before us. *See, e.g.*, *Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017) ("[W]e need only construe terms 'that are in controversy, and only to the extent necessary to resolve the controversy.'" (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

2. "Shifting According to a Distance of an Object . . ."

Claims 1 and 19 require that the "reducing" limitations are performed "by shifting the Tele image relative to the Wide image according to a distance of an object in a Tele image region of interest (ROI)," and/or "by shifting the Wide image relative to the Tele image according to a distance of an object in a Wide image ROI."

Patent Owner contends that the plain and ordinary meaning of the "shifting" limitation is "shifting . . . . ***based on*** a distance of an object in a [Tele image region of interest (ROI)]/[Wide image ROI]." PO Resp. 11 (citing Ex. 2015 ¶ 46). Patent Owner cites numerous portions of the '942 patent in support of its contention that "according to" should be construed as "based on" and that doing so would be to give the term "according to" "its plain and ordinary meaning in the context of the patent." *See* Ex. 1001, 3:64–65 ("The fused image is processed according to a user zoom factor request."); 7:2–3 ("the system is designed according to the following rules"); 7:19–20 ("The zoom switching point is set according to the ratio between

sensor pixels in-line and the number of pixels in-line in the video format"); 8:22–23 ("the relative exposure time may be configured according to the formula below"); 9:50–51 ("the Tele image is resampled according to the registration map").

Petitioner did not expressly construe the "shifting" limitation in the Petition. *See generally* Pet. In its Reply, Petitioner responds to Patent Owner's proposed construction and asserts that the "shifting" limitation should be construed as "shifting…*depending* on a distance of an object." Pet. Reply 1 (emphasis added). Petitioner contends that its "proposed construction is consistent with [the] ordinary meaning of 'according to' from dictionaries." *Id.* at 4 (citing Ex. 1040 ¶ 11; Ex. 1051, 12 (definitions including "in conformity with: consistently with" and "contingently upon: depending on"); Ex. 1050, 10 (definitions including "in a manner corresponding or conforming to" and "in proportion or relation to"); Ex. 1049, 6 (defining as "in relation to").

Petitioner implicitly construes the "shifting" limitation in its Petition as follows:

> Martin explains that "[a]s a result of the **parallax information** contained in the images, an **apparent shift of object** may exist between different views," where the "apparent shift refers to the distance a point in an image appears to move between images taken from different points view," and because such a shift is dependent on a distance of that object, "**a depth map for objects** in the scene can be computed" based on the parallax information.

Pet. 31 (quoting Ex. 1006, 7:8–12, 7:30–32). Petitioner supports its position with evidence, U.S. Patent No. 7,561,788 (Ex. 1031, "Kobayashi"), that it "was well-known in the art that an object shift in the parallax images depends on the distance of the object in the ROI." *Id.* (citing Ex. 1031, Figs.

3A, 3B, 6:44–45 ("the parallax P changes depending on the distance to the target"); 6:25–38; Ex. 1003 ¶ 98).

With regard to Patent Owner's proposed construction, we are not persuaded that the cited disclosures of the '942 patent "'clearly set forth a definition of the disputed claim term' other than its plain and ordinary meaning." *See Thorner v. Sony Comput. Entm't Am. LLC*, 669 F.3d 1362, 1365 (Fed. Cir. 2012) (quoting *CCS Fitness, Inc. v. Brunswick Corp.*, 288 F.3d 1359, 1366 (Fed. Cir. 2002)). "We depart from the plain and ordinary meaning of claim terms based on the specification in only two instances: lexicography and disavowal." *Hill-Rom Servs., Inc. v. Stryker Corp.*, 755 F.3d 1367, 1371 (Fed. Cir. 2014) (citing *Thorner*, 669 F.3d at 1365). "'To act as its own lexicographer, a patentee must clearly set forth a definition of the disputed claim term other than its plain and ordinary meaning' and must 'clearly express an intent to redefine the term.'" *Id.* (quoting *Thorner*, 669 F.3d at 1365). "Disavowal requires that 'the specification [or prosecution history] make[] clear that the invention does not include a particular feature,' or is clearly limited to a particular form of the invention." *Id.* at 1372 (alterations in original) (internal citations omitted).

None of the cited disclosures of the '942 patent support Patent Owner's proposed construction. *Id.* Like in *Hill-Rom*, there is neither "disclaimer or lexicography" nor "words of manifest exclusion or restriction." *Id.* For example, there is no disclosure "expressing the advantages, importance, or essentiality" of the term "according to" to mean "based on." *Id.* Nor is there disclosure of "language of limitation or restriction" with respect to the term "according to"—the '942 patent specification does not limit the term "according to" to something that *must*

be based on, e.g., an object distance. *Id.* The prosecution history of the '942 patent does not indicate a disavowal of claim scope with respect to the claim term "according to" in the context of the "shifting" limitation. *See generally* Ex. 1002.

Even if we accept Patent Owner's contention that "according to" in the context of the '942 patent's "shifting" limitation is used consistently in a manner that means "based on," despite consistent usage in a particular manner, none of the cited portions of the '942 patent indicate an intention to depart from the plain and ordinary meaning of "according to" in the context of the "shifting" limitation. The Federal Circuit has "repeatedly held that it is 'not enough that the only embodiments, or all of the embodiments, contain a particular limitation' to limit claims beyond their plain meaning." *Unwired Planet, LLC v. Apple Inc.*, 829 F.3d 1353, 1359 (Fed. Cir. 2016) (citing *Thorner*, 669 F.3d at 1366; *GE Lighting Sols., LLC v. AgiLight, Inc.*, 750 F.3d 1304, 1309 (Fed. Cir. 2014)).

We discern that the actual dispute between the parties concerns whether the shifting *directly* depends on "a distance of an object," or *indirectly* depends on "a distance of an object." *Cf.* PO Resp. 8 (citing Ex. 2015 ¶ 39). Turning to the specification of the '942 patent, the term "distance" appears only once—in the context of position matching. *See* Ex. 1001, 10:45–51. In relevant part, the specification of the '942 patent discloses that

> an entire image position matching between the sub-camera outputs is in many cases impossible, because parallax causes the position shift to be *dependent on the object distance*. Therefore, in a smooth transition as disclosed herein, the position matching is achieved only in the ROI region while scale brightness and color are matched for the entire output image area.

Id. (emphasis added). Another relevant portion of the specification, which does not specifically use the term object distance, discusses how the "shifting" or "translation" is performed and how a depth map is calculated:

> for a given ROI, registration is performed between the Wide and Tele images to output a transformation coefficient . . . The transformation coefficient includes the translation between matching points in the two images. This translation can be measured in a number of pixels. Different translations will result in a different number of pixel movements between matching points in the images. *This movement can be translated into depth and the depth can be translated into an AF position*. This enables to set the AF position by only analyzing two images (Wide & Tele). The result is fast focusing.

Id. at 12:4–15 (emphasis added).

> During prosecution, Applicant argued that it
>
> has further found that due to the fact that artifacts caused by the parallax effect depend on the specific object distance in a given image, it is necessary to repeat position matching during every switching, *since the objects [sic] distances in the image are unknown*. Also, when an image includes various objects with different objects distances, position matching can be performed on a specific region of interest (ROI) within the image.

PO Resp. 14 (quoting Ex. 1038, 314) (emphasis added). Patent Owner argues that "Applicant's remarks also establish that, 'during every switching' of the camera system contemplated by the inventors, *the distance to objects in the ROI are not known a priori*, and thus 'it is necessary to repeat position matching during every switching.' It does not mean, as Petitioner implies, that 'objects [sic] distances' are never known or not used by the invention of the '942 patent to reduce an image jump effect." *Id.* (citing Pet. 33; Ex. 2015 ¶ 51) (emphasis added).

The '942 patent specification does not sufficiently support the position that the "shifting" limitation is limited to being performed directly based on object distance. This is true particularly in light of the facts that, the specification does not explain how the "shifting" limitation could be performed using an object distance or how anything is calculated using a quantitative value for object distance, prior to setting an AF[14] position. Additionally, Applicant acknowledges, during prosecution, that the "the objects [sic] distances in the image are unknown." Ex. 1038, 314.

The above-quoted disclosures and the prosecution history tend to support the position that translating (i.e., shifting) by a certain number of pixels is not directly based on a quantitative value for object distance.

Instead, we determine that the '942 patent specification supports the position that the "shifting" limitation can be performed indirectly based on object distance. This determination is supported by the above-quoted disclosures of the '942 patent, its prosecution history, and the dictionary definitions of "according to." *See* Ex. 1051, 12; Ex. 1050, 10; Ex. 1049, 6.

Were we to construe this limitation as requiring that the shifting be directly based on object distance, we would exclude the only embodiment in the specification, which we find would be improper here. *See* Ex. 1001, 2:66–3:8; *SynQor, Inc. v. Artesyn Techs., Inc.*, 709 F.3d 1365, 1378–79 (Fed. Cir. 2013) ("A claim construction that 'excludes the preferred embodiment is rarely, if ever, correct and would require highly persuasive evidentiary support.'"). Petitioner implicitly construes the "shifting" limitation as we construe it by citing, in relevant part, Martin's

[14] Although Patent Owner suggests AF means auto-focus (PO Resp. 13), the '942 patent does not indicate what AF stands for.

teaching of "parallax information" affecting an "apparent shift of object," which is "dependent on a distance of that object," as well as computing "a depth map for objects in [a] scene," which Martin discloses is done by "determining position values for enough scene points in an image." *See* Pet. 31 (citing Ex. 1006, 7:8–12, 7:30–32); Ex. 1006, 7:30–32 (emphasis omitted). Patent Owner takes issue with Petitioner's implicit construction, contending that

> Petitioner argues "the shift in Martin is therefore ***according to a distance*** to the object in the succeeding image ROI, ***because the amount of shift is determined during registration*** for transforming the succeeding image to the preceding image, ***which depends*** on the amount of parallax, ***which in turn depends*** on the distance to the object in the succeeding image ROI."
>
> * * *
>
> Petitioner's argument based upon Martin . . . suggest[ing] [that] it believes the "according to" language can be satisfied by multiple levels of logical dependencies. Petitioner thinks the operative action ("shift") can be performed "according to" an external variable ("distance to an object [in an ROI]," merely as long as the action ("shift") is performed based on ***another*** variable (use of pattern/feature matching) from which a set of values (quantitative parallax information) can be derived, from which ***another set of values*** (a depth map) can be further calculated.

PO Resp. 8–9 (citing Pet. 31; Ex. 2015 ¶¶ 40, 42).

Petitioner's position initially set forth in its Petition is consistent with the disclosures of the'942 patent. The '942 patent discloses that, between images, "parallax causes the position shift to be dependent on the object distance," and according to its prosecution history, this distance is unknown. *See* Ex. 1001, 10:47–48; Ex. 1038, 314. As such, a transformation coefficient is determined—the transformation coefficient indicates a

translation between matching points in the two images. Ex. 1001, 12:5–8. Accordingly, the '942 patent describes how the translation is *based on* the transformation coefficient which is, *in turn*, based on the parallax effect shown between the two images, which is, *in turn*, based on the object distance. Further, the translation is performed by moving, in increments of pixels, between the matching points in the two images—this movement can be translated into depth, or object distance, and thus a specific value for object distance is derived from the translation. *See* Ex. 1001, 12:9–13.

We determine that the "shifting" limitation *encompasses* translating, or shifting, images based on transformation coefficients because the transformation coefficients are determined based on two images displaying an object that appears to shift position between the two images because of an effect of parallax, and the parallax is based on a distance to the object. Further, the value of the distance to the object is derivable from the translation.

For the foregoing reasons, we are not persuaded by Patent Owner's argument that Petitioner's showing fails for being based on "multiple levels of logical dependencies." *See* PO Resp. 9. Although Patent Owner argues otherwise, Patent Owner appears to have the same understanding: "the patent also teaches performing the claimed 'shifting' based on the 'distance of an object' in an ROI, *through the use of a transformation coefficient* that is computed from 'registration [] performed between the Wide and Tele images.' The 'transformation coefficient' *indicates a distance to an object* in an ROI, and as such 'the transformation coefficient is used to set an AF [auto-focus] position.'" PO Resp. 13 (citing Ex. 1001, 12:3–7) (emphases added). Petitioner similarly asserts that "the '942 Patent describes that **after**

determining the shift using registration, a distance of an object can be computed **from** the shift." Pet. Reply 3 (citing Ex. 1001, 12:9–13 (Petitioner arguing that "distance ('depth') to an object can be computed from transformation coefficient"); Ex. 1040 ¶ 6).

Below in Section in III.D.3, we address whether the combination of Golan and Martin teaches the "shifting" limitation.

D. Obviousness over Golan and Martin

Petitioner contends that claims 1, 2, 4, 19, 20, and 22 are unpatentable as obvious under 35 U.S.C. § 103 over Golan and Martin. Pet. 12–44. For the reasons that follow, we determine that Petitioner establishes unpatentability of claims 1, 2, 4, 19, 20, and 22 by a preponderance of the evidence.

1. Overview of Golan (Ex. 1005)

Golan concerns a "method for continuous electronic zoom in a computerized image acquisition system," in which the system has "a wide image acquisition device and a tele image acquisition device." Ex. 1005, code (57). By providing "multiple imaging devices each with a different fixed field of view (FOV)," Golan's system "facilitates a light weight electronic zoom with a large lossless zooming range." *Id.* ¶ 9. Golan's Figure 1, reproduced below, illustrates a zoom control sub-system for an image acquisition system. *Id.* ¶ 26.

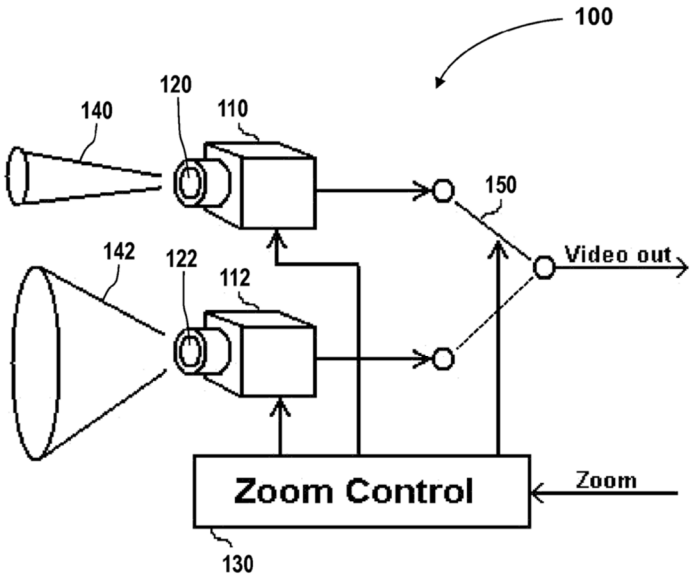


Fig 1

Figure 1 of Golan illustrates a zoom control sub-system for an image acquisition system. *Id.*

According to Golan, "[z]oom control sub-system 100 includes a tele image sensor 110 coupled with a narrow lens 120 having a predesigned FOV 140, a wide image sensor 112 coupled with a wide lens 122 having a predesigned FOV 142, a zoom control module 130 and an image sensor selector 150." *Id.* ¶ 37. Zoom control circuit 130 selects an appropriate image sensor through image sensor selector 150 and calculates a camera zoom factor when it receives a required zoom from an operator. *Id.* ¶ 39. Golan's system facilitates "continuous electronic zoom capabilities with uninterrupted imaging," which "is also maintained when switching back and forth between adjacently disposed image sensors." *Id.* ¶ 40.

2. Overview of Martin (Ex. 1006)

Martin concerns a method for generating an autostereoscopic display by aligning a first parallax image and at least one other parallax image. Ex. 1006, code (57). By manipulating parallax images—two or more images with overlapping visual fields but different points of view—Martin's method creates a moving three-dimensional image without the use of special viewing aids, i.e., an autostereoscopic display. *Id.* at 1:16–20; 3:32–41. Martin's Figure 1, reproduced below, illustrates a method of capturing parallax images. *Id.* at 3:41–51.

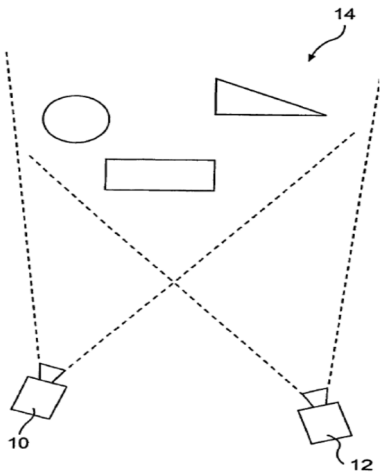
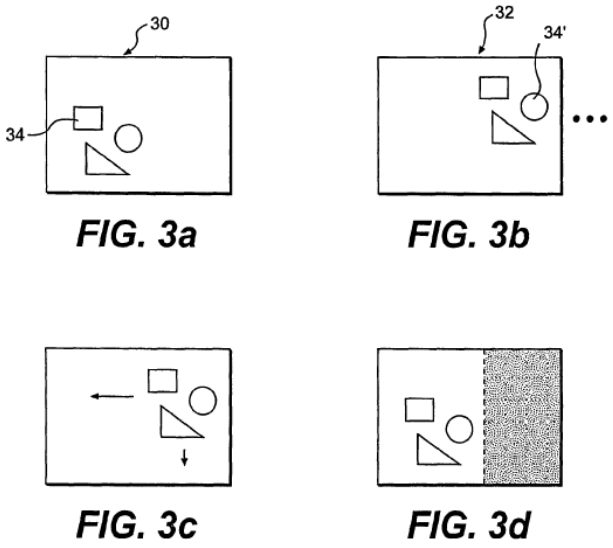


FIG. 1

Figure 1 of Martin illustrates exemplary camera positions for generating parallax images. *Id.* at 3:17–18.

According to Martin, "a camera 10 may capture a first set of images and a camera 12 may capture a second set of images of a common scene 14 while being displaced from one another. The resulting sets of images from cameras 10 and 12 will be parallax images." *Id.* at 3:42–46. Martin discloses generating a set of aligned parallax images by displaying alternating views of two or more parallax images at a desired view rate and

manipulating the images such that at least a portion of the images are aligned with each other. *Id.* at 3:6–13. Figures 3a–3d, reproduced below, illustrate an alignment process.



Figures 3a–3d of Martin illustrate a transformation process for aligning parallax images. *Id.* at 3:20–22.

In Martin, "[t]he alignment matching process begins by selecting a reference image 30, as shown in FIG. 3a, from a set of parallax images. Once reference image 30 has been selected, other images 32, as shown in FIG. 3b, from the parallax image set can be aligned to reference image 30." *Id.* at 4:39–43. "Reference image 30 may include region of interest 34." *Id.* at 4:51. "Unaligned image 32 may be manipulated, as shown in FIG. 3c, for example, until region 34' matches alignment with region 34, as illustrated in FIG. 3d." *Id.* at 4:54–56. "The manipulation process may be represented by an affine transformation including translation, rotation, scaling, and/or any other desired transformation." *Id.* at 4:56–59.

Martin discloses that a computer may align the images using convergence points in the images. *Id.* at 5:6–11. "The computer may further

perform pattern matching or feature extraction algorithms . . . to match alignment of regions of interest in the selected images at or near the selected convergence points." *Id.* at 5:11–29. The computer may continuously adjust the transformation parameters to achieve "critical alignment," corresponding "to a condition where the degree of alignment is sufficient to achieve a stable auto-stereoscopic display. Stability of the whole image may not be required, as long as at least a particular region of interest in the auto stereoscopic display is stable." *Id.* at 5:53–59. Martin further discloses that the process may include "parallax image manipulations of sub-pixel resolution to achieve critical alignment . . . where one image is moved with respect to another image by an amount less than an integral number of pixels." *Id.* at 5:59–65.

3. Independent Claim 1

> *"A multiple aperture zoom digital camera, comprising:"*
>
> *"a) a Wide imaging section that includes a Wide sensor and a fixed focal length Wide lens with a Wide field of view (FOV), the Wide imaging section operative to output a Wide image"*
>
> *"b) a Tele imaging section that includes a Tele sensor and a fixed focal length Tele lens with a Tele FOV that is narrower than the Wide FOV, the Tele imaging section operative to output a Tele image; and"*

Petitioner contends that the embodiment depicted in Figure 1 of Golan teaches "a zoom digital imaging system with multiple imaging devices each defining an aperture for capturing a digital image." Pet. 20 (citing Ex. 1005 ¶¶ 3, 9, 37, 39, code (54); Ex. 1003 ¶¶ 61–62). Petitioner explains that in Golan's image acquisition system,

> each of the Wide imaging device (including wide image sensor 112 and wide lens 122) and the Tele imaging device (including tele image sensor 110 and narrow lens 120) defines an aperture for generating a corresponding digital image, and as such, is a multiple aperture digital camera providing digital zoom.

Id. at 20–21 (citing Ex. 1005, Fig. 1; Ex. 1003 ¶ 63; Ex. 1001, 3:29; Ex. 1038, 316 (Patent Owner's remarks about Golan during prosecution of the '233 patent)).

Petitioner further contends that Golan teaches the claimed Wide imaging section and Tele imaging section. *Id.* at 21–24. Specifically, Petitioner argues Golan discloses "a Wide imaging section that includes a wide lens 122 (fixed focal length Wide lens) with FOV [Field of View] 142 (Wide field of view FOV) and a wide image sensor 112 (Wide sensor)." *Id.* at 21 (citing Ex. 1005 ¶¶ 36–37, Fig. 1; Ex. 1003 ¶ 66); *see id.* at 22 (citing Ex. 1001, 7:3–5; Ex. 1003 ¶¶ 67–73; Ex. 1005 ¶¶ 9, 36, 37, 43; Ex. 1017, Fig. 4.13, 48).

Petitioner also contends that Golan's zoom control sub-system 100 includes "a Tele imaging section that includes a tele image sensor 110 (Tele sensor) coupled with narrow lens 120 (a fixed focal length Tele lens) having fixed FOV 140 (Tele FOV)." *Id.* at 23 (citing Ex. 1003 ¶ 76; Ex. 1005 ¶¶ 36, 37, code (57), Fig. 1); *see id.* at 24 (citing Ex. 1003 ¶¶ 77–80; Ex. 1005 ¶¶ 9, 36, 37, 39, 41, 43, 48). Petitioner further asserts that Golan discloses that "tele FOV 140 is narrower than FOV 142" and that "wide FOV 142 is substantially wider than narrow FOV 140." *Id.* (quoting Ex. 1005 ¶ 43) (citing Ex. 1003 ¶ 78; Ex. 1005, Fig. 1, ¶¶ 9, 37) (emphasis omitted).

Patent Owner does not specifically address the preamble and the Wide and Tele imaging sections of claim 1. *See generally* PO. Resp. We have reviewed Petitioner's contentions, the cited portions of Golan and Mart, and Dr. Durand's testimony and we determine that Petitioner's contentions for the preamble and the Wide imaging section of limitation (a) and the Tele imaging section limitation (b) of claim 1 are sufficiently supported.[15]

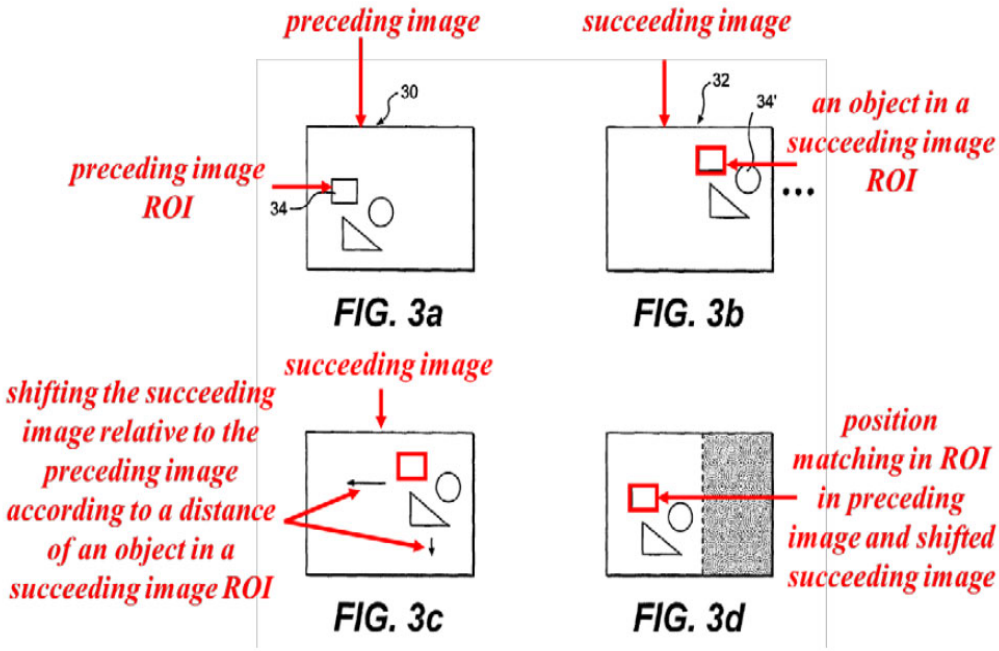
> *"c) a camera controller operatively coupled to the Wide and Tele imaging sections and configured, when providing video output images, to:*
>
> *reduce an image jump effect seen in the video output images when switching from a Wide image to a Tele image by shifting the Tele image relative to the Wide image according to a distance of an object in a Tele image region of interest (ROI), and/or*
>
> *reduce an image jump effect seen in the video output images when switching from a Tele image to a Wide image by shifting the Wide image relative to the Tele image according to a distance of an object in a Wide image ROI."*

Petitioner contends that "Golan's zoom control sub-system 100 includes a camera controller including zoom control circuit 130 coupled to the Wide and Tele imaging sections for receiving a requested zoom and provides an acquired image frame with the requested zoom . . . ." Pet. 25 (citing Ex. 1003 ¶ 85); *see id.* at 25 (citing Ex. 1005, Figs. 1 and 2, claim 1, ¶¶ 48, 49; Ex. 1003 ¶¶ 83, 84). Petitioner relies on the combination of Golan and Martin to teach the claimed configuration of the camera controller. *Id.* at 26–36. Specifically, Petitioner contends that Golan discloses reducing the

[15] We need not determine whether the preamble is limiting because Petitioner shows sufficiently that it is satisfied by the prior art.

"'jump effect seen in video output images when switching from a [preceding] image to a [succeeding] image' as claimed . . . because it teaches reducing a discontinuous image change in video output images to achieve uninterrupted imaging when switching between Wide and Tele images using electronic calibration." *Id.* at 27 (citing Ex. 1005, code (57); Ex. 1003 ¶¶ 90, 91) (emphasis omitted) (alterations in the original).

Petitioner contends that "Martin teaches reducing an image jump effect seen in video output images and providing stable video output images when switching from a preceding image to a succeeding image from different points of view . . . by performing critical alignment to corresponding ROI[s] in the two images." *Id.* (citing Ex. 1003 ¶¶ 92, 93). Petitioner asserts that Martin's Figure 3, reproduced as annotated below, illustrates registration between two images as part of Martin's critical alignment. *Id.* at 27–29 (citing-in-part Ex. 1006, 4:51–56).



Petitioner's annotated version of Martin's

Figures 3A–3D. *Id.* at 29.[16]

According to Petitioner, the annotated version of Martin's Figures 3A through 3D depicts

> shifting the succeeding image (e.g., unaligned image 32 of FIG. 3b) relative to the preceding image (e.g., reference image 30 of FIG. 3a) for position matching the succeeding image ROI (e.g., object in ROI 34' in unaligned image 32) to the preceding image ROI in the video output images when switching, where the shift depends on a distance of an object in the succeeding image ROI (e.g., region of interest 34' of unaligned image 32).

Id. at 30 (citing Ex. 1003 ¶ 97). Petitioner further argues that "Martin's critical alignment teaches determining correspondences between the coordinate systems of the two images from different points of view, which represent the registration between the two images," thus "executing registration of two images for position matching in the ROI." *Id.* at 29–30 (citing Ex. 1003 ¶ 96; Ex. 1006, 4:56–59, 5:10–50; Ex. 1009 ¶¶ 41, 42; Ex. 1013, Figs. 2.4, 6.2, Tables 2.1, 6.1, 33–35, 273–77; Ex. 1016, 137).

Petitioner takes the position that a person of ordinary skill in the art would have understood that the critical alignment of Martin would "reduce [a] jump effect seen in video output images . . . because it teaches reducing a discontinuous image change in video output images to achieve a stable transition between successive parallax images." *Id.* at 33 (citing Ex. 1003 ¶ 100).

a) Analysis of Golan and Martin

In addition to determining that the combination of Golan and Martin teaches the preamble as well as limitations (a) and (b) as we did above, we

[16] Petitioner apparently takes the position that element number 34' should reference the rectangle, not the circle, in Martin's Figure 3b.

further determine that the combination of Golan and Martin teaches limitation (c).

First, we determine that Golan supports Petitioner's contentions regarding the first part of limitation (c) of independent claim 1. A cited portion of Golan discloses a "[z]oom control sub-system 100 includes multiple image sensors, each with a fixed and preferably different FOV, configured to provide continuous electronic zoom capabilities with uninterrupted [imaging] when switching back and forth between the image sensors." Ex. 1005 ¶ 36. Golan further discloses that "[t]he calibration of the alignment, between the first image sensor array and the second image sensor array, facilitates continuous electronic zoom with uninterrupted imaging, when switching back and forth between the first image sensor array and the second image sensor array." *Id.* ¶ 15. Golan also discloses that "[b]efore using zoom control sub-system 100, an electronically [sic] calibrating is performed to determine the alignment offsets between wide image sensor array 110 and tele image sensor array 112." *Id.* ¶ 38. According to Golan, "the electronic calibration step is performed one time, after the manufacturing of the image acquisition system and before the first use." *Id.* Thus, Golan sufficiently supports Petitioner's contentions regarding the first part of limitation (c) of independent claim 1.

Second, we determine that Martin teaches the remaining part of limitation (c). A cited portion of Martin discloses

> Reference image 30 may include a region of interest 34. The same region of interest 34', albeit as viewed from a different point of view, may appear in unaligned image 32. Unaligned image 32 may be manipulated, as shown in FIG. 3c, for example, until region 34' matches alignment with region 34, as illustrated in FIG. 3d. The manipulation process may be represented by an

> affine transformation including translation, rotation, scaling, and/or any other desired transformation.

Ex. 1006, 4:51–59. Martin further discloses that "[c]ritical alignment corresponds to a condition where the degree of alignment is sufficient to achieve a stable auto stereoscopic display," and that "[s]tability of the whole image may not be required, as long as at least a particular region of interest in the auto stereoscopic display is stable." *Id.* at 5:53–58. According to Martin, "[o]ne of the key elements of the disclosed alignment process is the use of parallax image manipulations of sub-pixel resolution to achieve critical alignment" and "the transformations for achieving critical alignment may proceed to a sub-pixel level where one image is moved with respect to another image by an amount less than an integral number of pixels." *Id.* at 5:59–65; *see also id.* at 7:46–51 ("while displaying the images, aligning a user-selected region of interest associated with the first image with a corresponding region of interest of the second image such that said region of interest of the first image occupies in the display the same location as the region of interest in the second image").

Martin further discloses that, "[a]s a result of the parallax information contained in the images, an apparent shift of an object may exist between different views," and that "[t]he apparent shift refers to the distance a point in an image appears to move between images taken from different points of view." Ex. 1006, 7:8–12. According to Martin, "by determining position values for enough scene points in an image, a depth map for objects in the scene can be computed." *Id.* at 7:30–32. According to Petitioner, it was "well-known in the art that an object shift in the parallax images depends on the distance of the object in the ROI." Pet. 31 (citing Ex. 1031, Figs. 3A,

3B, 6:25–38, 44–45; Ex. 1003 ¶ 98). Having reviewed Petitioner's arguments, the cited evidence, and Dr. Durand's testimony, we determine Martin sufficiently supports Petitioner's contentions with respect to the second part of limitation (c) of independent claim 1.

b) Petitioner's Rationale for Combining

Petitioner contends a person of ordinary skill in the art would have been motivated to apply Martin's teachings to Golan "to produce the obvious, beneficial, and predictable results of a stable transition between images from different points of view for providing continuous zoom video output images." Pet. 16 (citing Ex. 1003 ¶¶ 52–59). Petitioner supports its contention with the following reasons.

First, that "the references are analogous prior art and are in the same field of endeavor pertaining to imaging systems generating video output images using two imaging sections having different points of view." *Id.* (quoting Ex. 1003 ¶ 53).

Second, that "they share a need to provide continuous video output images when switching between images from imaging sections having different points of view, for example, by using alignments having sub-pixel accuracy." *Id.* at 17 (citing Ex. 1003 ¶ 54); *see id.* (citing Ex. 1005 ¶ 15; Ex. 1006, 5:51–55, 5:59–6:5).

Third, that Martin addresses these needs identified in Golan by providing "critical alignment of an ROI in two images having different points of view to calculate 'transformation parameters of subpixel resolution' for position matching of the ROI to achieve a stable transition in the continuous zoom video output images of the digital camera of Golan." *Id.* at 18 (quoting Ex. 1006, 5:51–58) (citing Ex. 1003 ¶ 55; Ex. 1005 ¶ 36).

Fourth, that applying Martin to the teachings of Golan would have required no more than combining "known elements according to known methods (such as performing critical alignment of an ROI in Wide and Tele images for position matching when switching between Wide and Tele images in zoom control subsystem of Golan) to achieve the benefits of a stable transition in video output images described by Martin." *Id.* at 19. According to Petitioner, the combined teachings of Golan and Martin would have "produced operable results that are predictable." *Id*. at 18 (citing Ex. 1003 ¶ 57).

Fifth, that Golan and Martin have a "shared goal to provide continuous video output images with seamless transition when switching between images from two imaging sections." *Id.* at 19 (citing Ex. 1003 ¶ 58). According to Petitioner,

> A POSITA would have sought to improve the efficacy of Golan's image sensor alignments (e.g., determined at the time of manufacture without consideration of different parallax shifts for objects of different distances) with image registration-based critical alignment as taught by Martin (e.g., determined after the images are captured and dependent on object distances) to improve robustness of the seamless transition when switching for continuous zoom output images.

Id.

c) Analysis of Rationale for Combining

With respect to Petitioner's rationale for combining, we are persuaded by Petitioner's *third* and *fourth* reasons for combining the references.

Citing Ahiska (Ex. 1007), Orimoto (Ex. 1014), Hansen (Ex. 1019), and Border (Ex. 1009) in support, Dr. Durand testifies that

> It was well known in the art that for seamless transition between successive images from different points of views in continuous zoom video applications, when calibration between two cameras (e.g., the electronic calibration of Golan) is not sufficient alone (e.g., because of shocking, vibration, thermal variation, etc.), image registration of two images from two imaging sections for position matching (e.g., critical alignment of Martin including shifting according to a distance of an object in the ROI) may be used.

Ex. 1003 ¶ 57 (citing Ex. 1007, 4:58–62, 10:2–5; Ex. 1014, 1:58–62; Ex. 1019, 1059; Ex. 1009 ¶¶ 41, 42).[17]

The portion of Hansen (Ex. 1019) cited by Dr. Durand addresses how extrinsic calibration errors occur and "a method to recalibrate extrinsic parameters online to correct drift or bias." Ex. 1019, 1059. Orimoto discloses how misalignment occurs, irrespective of "how exactly the dual lens camera has been conditioned and adjusted by the manufacturer." Ex. 1014, 1:63–2:1. The portions of Border cited by Dr. Durand address image registration as an alternative to correspondence (i.e., calibration). Ex. 1009 ¶¶ 41, 42. And the portions of Ahiska cited by Dr. Durand address image registration or matching, when calibration is insufficient, to provide a seamless transition between master and slave cameras and "create the quality of a continuous zoom function." Ex. 1007, 4:58–62, 10:2–5. Thus, each of Border and Ahiska show a relation between electronic calibration

[17] We note that Dr. Durand cites to column 1, lines 58–62 of Orimoto in connection with his testimony regarding the rationale for combining Golan and Martin, although he appears to quote from column 1, line 63 through column 2, line 1. Ex. 1003 ¶ 56. In IPR2020-00487, Dr. Durand cites to column 1, line 63 through column 2, lines 1. IPR2020-00487, Ex. 1003 ¶ 57 (citing Ex. 1007, 4:58–62, 10:2–5; Ex. 1014, 1:63:2:1; Ex. 1019, 1059; Ex. 1009 ¶¶ 41, 42).

and registration, with registration being an alternative to (Border) or next step (Ahiska) after electronic calibration. As such, Petitioner's rationale for combining Golan and Martin is supported by Dr. Durand's testimony quoted above, which is in turn supported by Ahiska and Border.

For the foregoing reasons, we are persuaded that Petitioner's rationale for combining Golan and Martin is supported by sufficient rational underpinning. *See KSR*, 550 at 418. We are further persuaded that the cited evidence, Ahiska and Border, sufficiently support Dr. Durand's testimony.

d) Patent Owner's Contentions

First, Patent Owner contends that the "Golan and Martin references are fundamentally dissimilar, address different problems, and prescribe different techniques to address those different problems." PO Resp. 25 (citing *Nichia Corp. v. Everlight Americas, Inc*., 855 F.3d 1328, 1340 (Fed. Cir. 2017) (affirming district court conclusion finding no motivation to combine where the combination of references relating to LED packages "describe[d] different structures" and "address[ed] different problems")))). Patent Owner argues that "Golan prescribes an 'electronic calibration' based on the physical location of the two image sensors in Golan's digital camera, and that 'electronic calibration' is performed only once and without the use of position matching being performed on image data." *Id.* at 26 (citing Ex. 2015 ¶ 80). "Martin's objective, in contrast, is to 'produc[e] two-dimensional images that, upon display, can be perceived to be three-dimensional' and, specifically, to address 'one or more of the problems associated with the prior art three-dimensional image display systems and methods.'" *Id.* (citing Ex. 1006, 2:60–62; Ex. 2015 ¶ 81).

Patent Owner further contends that "[n]othing in Martin suggests a POSITA would have perceived Martin to have a similar goal to Golan's goal of providing 'continuous electronic zoom' in video output images (e.g., in the digital camera's digital-display viewfinder) when switching between two image sensors." PO Resp. 32. In support, Patent Owner contends that Golan's video is displayed at "the industry-standard 24 frames-per-second (or '24 Hz')," whereas Martin's alternating views are displayed at 3Hz to 6Hz. PO Resp. 32–33. Patent Owner also contends that:

> Petitioner's alleged "switching" in Martin is unlike the "switching" in Golan. Golan's "switching" concerns the video displayed for electronic zoom when the camera "switches" "back and forth between the wide image sensor array and the tele image sensor array" between different zoom factors. The purported "switching" in Martin, to the extent it could even be fairly described as "switching," refers to the ***alternating*** display of two specific image frames that is refreshed three to six times per second. Thus, a POSITA would not consider Golan and Martin to be concerned with the same kind of "switching."

Id. at 33 (Ex. 2015 ¶ 94).

Second, Patent Owner contends that "Golan does not teach 'image registration' as part of its system for providing a 'continuous electronic zoom.'" *Id.* at 22. "Instead, Golan teaches using an 'electronic calibration' based on the physical (spatial) location of the two image sensors in the camera." *Id.* Patent Owner notes that

> Golan's "electronic calibration" is performed only once, after the camera's manufacture and before its first use, to yield values representing the "alignment offsets" in the form of X-, Y-, and (optionally) Z-coordinate offset values. Those values are then used to achieve "continuous electronic zoom . . . when switching back and forth between adjacently disposed image sensors."

Id. (citing Ex.1005 ¶ 38; Ex. 2015 ¶ 72; Ex. 2014, 29:6–32:2).

Patent Owner points to Applicant's statement during prosecution that, "[a]lthough position matching was known per se at the effective time of filing, the known art does not teach to use position matching for solving the aforementioned problem as part of the zooming process in video imaging, as claimed…." *Id.* at 24 (quoting Ex. 1002, 314–15) (citing Ex. 1010). Patent Owner further contends that

> None of the alleged prior art cited in the Petition discloses or teaches position matching (or any conventional image registration techniques, such as those discussed in Martin) to address the image jump effect in the zooming process of a multi-aperture camera system. Like the Examiner did with the Zitova reference in the prosecution history of the '233 patent, Petitioner here relies on Martin principally for its discussion of conventional image registration techniques to modify Golan's digital zooming process.

Id. (citing Ex. 2015 ¶¶ 76, 77).

Third, Patent Owner contends that "the core problem with Petitioner's argument for combining Golan and Martin involves a more basic question: 'whether [a] skilled artisan would have plucked one reference out of the sea of prior art … and combined with conventional [] elements to address some need present in the field.'" *Id.* at 21 (quoting *WBIP, LLC v. Kohler Co.*, 829 F.3d 1317, 1337 (Fed. Cir. 2016)).

Fourth, "Patent Owner contends that 'knowledge of a problem and motivation to solve it are entirely different from motivation to combine particular references.'" *Id.* at 30 (quoting *Metalcraft of Mayville, Inc. v. The Toro Co.*, 848 F.3d 1358, 1367 (Fed. Cir. 2017)) (quoting *Innogenetics, N.V. v. Abbott Labs.*, 512 F.3d 1363, 1373 (Fed. Cir. 2008)); *see* Ex. 2015 ¶ 88.

Fifth, Patent Owner contends that "Durand's 'analogous art' analysis is deficient because it fails to address whether Golan and Martin, separately,

are 'analogous' to the invention of the '942 patent," because it instead "appears to be limited to comparing Golan and Martin with one another and opining that they are in the 'same field of endeavor.'" *Id.* at 34 (citing Ex. 2015 ¶ 53) (emphasis omitted).

Sixth, Patent Owner contends that Petitioner's challenge is missing the limitation "by shifting the Tele image relative to the Wide image according to a distance of an object in a Tele image region of interest (ROI)." *Id.* at 35. More particularly, Patent Owner argues that Petitioner's challenge is deficient because it relies on Martin to perform the claimed "shifting" *indirectly* based on a distance to an object in its successive images. *Id.* at 39. As discussed above in Section III.C.2, Patent Owner takes issue with Petitioner's citation to Martin for teaching the latter half of the "reducing" limitation, the "shifting" limitation," because it teaches "multiple levels of logical dependencies" between the "shifting" and "a distance to an object." *Id.* (citing Ex. 2015 ¶ 106). Patent Owner disputes Petitioner's contention that "the action ('shift') can be performed 'according to' a variable ('distance to an object [in an ROI],' merely as long as that the action ('shift') is performed based on ***another*** variable (use of feature/pattern matching) from which a set of values (quantitative parallax information) can be derived, from which ***another set of values*** (a depth map) can be further calculated." *Id.* at 39.

Patent Owner also contends that "Martin's 'depth map' is computed **after** 'critical alignment' process is complete," and "[t]he fact a 'depth map' can be calculated *from* the aligned image does not teach or render obvious performing Martin's alignment 'according to' or 'based on' a distance to an object." *Id.* at 44 (citing Ex. 2015 ¶¶ 114–115).

Seventh, Patent Owner also contends that "'object shift' of an object shown in two parallax images . . . may be ***related*** to how far that object is from the camera(s) that generated those images, but the distance of the object from the camera(s) used to produce those images is not ***determinative*** of the calculated object shift." *Id.* at 41–42 (citing Ex. 2015 ¶ 110); *see id.* at 42–43 (arguing that "[o]ther factors will always affect the 'object shift' values" and that an expert would need complex math to *estimate* object distance based on additional inputs).

e) Some of Petitioner's Responsive Contentions

In response to Patent Owner's *first* argument, Petitioner responds by distinguishing *Nichia*, arguing that "the relevant teachings of Golan and Martin address the same problem, and a relation between solutions of Golan and Martin was well-known." Pet. Reply 12 (citations omitted). According to Petitioner, "Martin itself explains that 'proper alignment and color/luminance matching of the cameras can be difficult,' and describes critical alignment of region of interest (e.g., using transformation coefficients) to achieve a stable transition." *Id.* (citations omitted). Petitioner asserts that Golan and Martin both disclose "imaging systems includi[ng] digital cameras for generating video output images using two imaging sections having different points of view." *Id.* at 7 (citing Ex. 1040 ¶ 18; Pet. 16–17; Ex. 1005, Fig. 1, code (57), ¶¶ 9, 15, 36; Ex. 1006, Fig. 1, 3:6–13, 3:32–35; 4:10–15; Ex. 1041, 43, 55–59). Petitioner also asserts that Golan and Martin "are each pertinent to the problem addressed in the '942 Patent, namely, 'a "jump" (discontinuous) image change' '[w]hen switching between points of view, each of which corresponds to a camera.'" *Id.* at 8

(citing Ex. 1040 ¶ 20; Ex. 1001, 10:37–39; Ex. 1005 ¶ 15; Ex. 1006, 5:51–55).

f) Discussion of Patent Owner's Contentions

In response to Patent's Owner's *first* argument that Golan and Martin are "fundamentally dissimilar," we disagree. Both Golan and Martin involve parallax effects caused by two cameras with different fields of view, and they both address a common problem—a discontinuity in images that are misaligned due to parallax from two different cameras—albeit in different contexts and with different techniques. *See* PO Resp. 25.

Further, Martin also does not need to share a goal, objective, problem, or purpose in order to be combined with Golan. Petitioner need not show that Martin shares a common objective with Golan or the patent at issue. Rather, it is necessary only to show a motivation to combine and a reasonable expectation of success in combining the references to meet the limitations of the claimed invention. *See Intelligent Bio-Systems, Inc. v. Cambridge Illumina Ltd.*, 821 F.3d 1359, 1367 (Fed. Cir. 2016). Nonetheless, one of the problems noted by each of the references *is* shared in common between Golan and Martin, as discussed in the preceding paragraph.

In response to Patent Owner's *second* argument in which Patent Owner argues that Golan does not teach image registration as part of its "continuous electronic zoom," Petitioner's proposed combination relies on Martin for teaching this feature and as such, this argument does not adequately undermine Petitioner's showing. *See* PO Resp. 22. Similarly, when Patent Owner distinguishes Golan displays as video at a switching rate (e.g., 24 Hz) that is faster than that of Martin (e.g., 3Hz to 6 Hz), we note

that Petitioner does not rely on Martin for its teaching of switching. *See id.* at 32–33. These arguments individually attack the references and do not consider them in the combination presented by Petitioner. *See In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986) ("Non-obviousness cannot be established by attacking references individually where the rejection is based upon the teachings of a combination of references.") (citing *In re Keller*, 642 F.2d 413, 425 (CCPA 1981)). To the extent Patent Owner is arguing that Martin's switching rate must be combined with or incorporated into Golan, Petitioner's proposed combination is based on Golan's teaching of switching, not Martin's teaching of switching. *See Keller*, 642 F.2d at 426 ("The test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference. . . .").

Similarly, Patent Owner's citations to the prosecution history and contentions that Martin, like Zitova, is directed to conventional image registration techniques, and that "the known art does not teach to use position matching for solving the [image jump effect] as part of the zooming process in video imaging" are unavailing because Petitioner points to the combination of Golan and Martin, not Golan or Martin individually to teach the limitations of independent claim 1. *See* PO Resp. 24; *In re Merck*, 800 F.2d at 1097. Further, Patent Owner's assertion that Martin teaches conventional image registration techniques is not dispositive—how Martin is characterized is less relevant than how it meets the claim limitations.

In response to Patent Owner's *third* argument, Petitioner responds that the evidence of record does not indicate that there was a "sea" of other image registration or position matching patents or literature to choose from.

Pet. Reply 11. Petitioner further argues that it is not required to show why it chose one reference, in this case, Martin, over another, for example, Zitova. *Id.* at 10–11 (citing *Infineum USA L.P. v. Chevron Oronite Co. LLC*, 2021 WL 210722, *4 (Fed. Cir. 2021)). We determine Petitioner has the better position. We are persuaded that the evidence of record does not indicate that there were several alternatives that a POSITA could have chosen instead of Martin, let alone a "sea" or "ocean" as Patent Owner contends, nor has Patent Owner shown, for example, that Petitioner is relying on the concept of "combining known elements to yield predictable results" under which a finite number of alternatives may be required.[18] *See Fanduel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1346 (Fed. Cir. 2020) ("when the record shows a finite number of identified, predictable solutions to a design need that existed at the relevant time, which a person of ordinary skill in the art ha[d] a good reason to pursue, common sense can supply a motivation to combine") (citations and internal quotation marks omitted).

We are further persuaded that Petitioner need not explain why it chose Martin over another reference with similar teachings, or why its combination

[18] We do not suggest that this is required. *WBIP* was not concerned with showing that a particular reference could be found in the "sea"; rather, *WBIP* was pointing out that you must show a rationale to combine instead of assuming that "a person of skill, [has] two (and only two) references sitting on the table in front of him," *WBIP*, 829 F.3d at 1337. In other words, one does ***not*** need to show that there is something about the references relied on that is different than ***all*** other references in the "sea" ***nor*** does one need to show the sea is so small that the two references would be easily found (unless one is relying on combining known elements to yield predictable results.) *See Yeda Rsch. v. Mylan Pharms. Inc.*, 906 F.3d 1031, 1045 (Fed. Cir. 2018) (associating "sea" of prior art arguments with concept of "a finite number of identified, predictable solutions").

is superior. *See Novartis Pharms. Corp. v. W.-Ward Pharms. Int'l Ltd.*, 923 F.3d 1051, 1059 (Fed. Cir. 2019) ("It is thus improper to require West-Ward to prove that a person of ordinary skill would have selected everolimus over other prior art treatment methods."); *see also In re Fulton*, 391 F.3d 1195, 1200 (Fed. Cir. 2004) ("[O]ur case law does not require that a particular combination must be the preferred, or the most desirable, combination described in the prior art in order to provide motivation for the current invention.").

With regard to Patent Owner's *fourth* argument, citing *Metalcraft*, that knowledge of a problem and motivation to solve it are distinct from a motivation to combine, *Metalcraft* is distinguishable. In that case, a party, Toro, provided "no explanation or reasoning for concluding that one of skill in the art would have combined these particular references to produce the claimed invention. Without any explanation as to how or why the references would be combined to arrive at the claimed invention," the court was "left with only hindsight bias that *KSR* warns against." *Metalcraft*, 838 F.3d at 1369 (citing *KSR*, 550 U.S. at 421).

Here, Petitioner has reasons supporting its rationale for combining along with supporting evidence. Petitioner presents evidence, Ahiska (Ex. 1007), that tends to show a relation between electronic calibration and registration for position matching. Pet. 18; Ex. 1007, 4:58–62, 10:2–5 ("[i]f calibration between the master and slave cameras is insufficient alone, image registration or matching can be carried out . . . . " and "transition[ing] between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function."). We note that Petitioner sufficiently shows through its citation to, for example, Ahiska, both

knowledge of the problem, insufficient calibration, as well as not just a motivation to solve the problem, but an actual solution, or at least an improvement or next step, image registration for position matching as evidenced by at least Ahiska. Border also shows knowledge of the same problem, insufficient calibration, and a solution, image registration, as an alternative. *See id.* at 25 (citing Ex. 1009 ¶¶ 41, 42).

In response to Patent Owner's *fifth* argument, Petitioner compares Golan and Martin to each other instead of the claimed invention. Pet. 17–18. Art is analogous when it is: (1) from the same field of endeavor as the claimed invention; and (2) if the art is not from the same field of endeavor, reasonably pertinent to the particular problem faced by the inventor. *In re Bigio*, 381 F.3d 1320, 1325 (Fed. Cir. 2004).

As discussed above, in its Reply, Petitioner rectifies this and asserts that Golan and Martin are in the same field of endeavor as the claimed invention: "the imaging systems field, and more specifically, imaging systems includign [sic] digital cameras for generating video output images using two imaging sections having different points of view." Pet. Reply 7 (citing Ex. 1040 ¶ 18; Pet. 16–17; Ex.1005, Fig. 1, code (57), ¶¶ 9, 15, 36; Ex. 1006, Fig. 1, 3:6–13, 3:32–35; 4:10–15; Ex. 1041, 43, 55–59).[19] Also as

[19] Petitioner properly replied to Patent Owner's criticism of its showing regarding analogous art. *Dynamic Drinkware*, 800 F.3d at 1378 (finding an inter partes review petitioner has both the "burden of persuasion to prove unpatentability" and also "the initial burden of production," which "is a shifting burden, 'the allocation of which depends on where in the process of trial the issue arises.' The burden of production may entail 'producing additional evidence and presenting persuasive argument based on new evidence or evidence already of record.'"); *see also Apple Inc. v. Qualcomm Inc.*, IPR2018-01245, Paper 39, 16 (PTAB January 15, 2020) (citing

discussed above, Petitioner further asserts that "Golan and Martin are each pertinent to the problem addressed in the '942 Patent, namely, 'a "jump" (discontinuous) image change' '[w]hen a dual aperture camera switches the camera output between sub-cameras or points of view.')." *Id.* at 8 (citing Ex. 1040 ¶ 20; Ex. 1001, 10:37–39; Ex. 1005 ¶ 15; Ex. 1006, 5:51–55).

We determine that Golan and Martin are analogous art. Golan is in the same field of endeavor as the claimed invention because it describes performing digital zoom using a wide image sensor array and lens and a tele image sensor array and lens with the goal of providing "continuous electronic zoom with uninterrupted imaging." *See* Ex. 1005 ¶ 15. Martin is reasonably pertinent to the problem faced by the inventor: reducing an image jump effect seen in video output images when switching between cameras that have different fields of view. Both Golan and Martin have multiple cameras with differing fields of view. Martin describes the problem in terms of its solution: "[c]ritical alignment corresponds to a condition where the degree of alignment is sufficient to achieve a stable auto stereoscopic display" and "[s]tability of the whole image may not be required, as long as at least a particular region of interest in the auto stereoscopic display is stable." Ex. 1006, 5:53–58.

Patent Owner's *sixth* argument (i.e., that the "reduc[ing] a jump effect" limitation is lacking in Petitioner's combination) does not adequately undermine Petitioner's showing because, as we discussed above in Section III.C, we do not adopt Patent Owner's proposed claim construction of the "shifting" limitation that constitutes the latter half of the "reducing"

Dynamic Drinkware and finding a Petitioner properly established a reference was analogous art for the first time in its Petitioner Reply).

limitation. We determine that the combination of Golan and Martin sufficiently teaches the "reducing" limitation, specifically, the latter "shifting" portion of the limitation based on Martin's teaching of critical alignment, which is based on a distance to an object. With regard to Patent Owner's contention that Martin's depth map is calculated *after* its critical alignment process is complete, as we note above in Section III.C.2, calculating the depth map gives a *specific* value to a previously unknown object distance. This does not diminish the fact that object shift is based on object distance in Martin, albeit an unknown value of object distance—this is the same way the '942 patent describes it.

With regard to Patent Owner's *seventh* argument, this is supported only by Dr. Saber's testimony, which is not supported by any underlying evidence. Dr. Saber cites nothing to support his position that a POSITA could not calculate object distance from parallax, particularly in light of Martin's acknowledgment that additional inputs might be required. *See* Ex. 2015 ¶¶ 110–112. Patent Owner's position that "the distance of the object from the camera(a)" can be only *estimated* by an expert is not supported. *See id.*; *see* PO Resp. 41–43.

On the other hand, Petitioner's position and Dr. Durand's testimony that the parallax is based on distance to an object, is supported at least by Kobayashi. Pet. 31 (citing Ex. 1031, Figs. 3A, 3B, 6:44–45 ("the parallax P changes depending on the distance to the target"); 6:25–38; Ex. 1003 ¶ 98). In the cited portions, Kobayashi discloses that "[w]hen a distance to the target is L and the focal length of the optical system 2 is f, the parallax P can be calculated as P=d×f/L." Ex. 1031, 6:36–38. Dr. Durand testifies that the "shifting" limitation" is not limited to "shifting **only** according to a distance

of an object, and also does not exclude shifting according to any other factors." Ex. 1040 ¶ 60. Dr. Durand further testifies that "[t]he object shift is always dependent on multiple factors, including the relative positions of the cameras and their focal lengths." *Id.* As such, we find Patent Owner's argument unavailing. With regard to Patent Owner's converse position, that "the distance of the object from the camera(s) used to produce those images is not ***determinative*** of the calculated object shift," Dr. Saber substantially repeats Patent Owner's contention and similarly does not support this position with underlying evidence. *See, e.g.*, Ex. 2015 ¶¶ 110–112.

Furthermore, we note that Martin, like the '942 patent, does not calculate object distance using the P=d×f/L equation—the equation is relied upon to show that there is a direct relationship between parallax and distance to an object. Patent Owner acknowledges that "mathematical values representing an 'object shift' of an object shown in two parallax images . . . may be ***related*** to how far that object is from the camera(s) that generated those images . . . ." PO Resp. 41–42 (citing Ex. 2015 ¶ 110).

g) Patent Owner's Evidence of Secondary Considerations

Patent Owner presents evidence in the form of emails and its litigation complaint to show that "the licensing discussions between Petitioner and Patent Owner lasted over many years." PO Resp. 50. By its own admission, "Petitioner specifically asked Patent Owner for an 'option to license all of Corephotonics IP' in August 2016." *Id.* Patent Owner further notes that "[Petitioner] specifically asked for information about smooth transition technology." *Id.* (citing Pet. 50; Ex. 2007; Ex. 2011, Ex. 2012; Ex. 2015 ¶ 128). "The licensing discussions would have encompassed the smooth

transition technology," and a license to '291 patent, to which the '942 patent claims priority. *Id.* These discussions, Patent Owner contends, establish "that there is a 'nexus' between the licensing negotiations between Patent Owner and Petitioner as [to] the claims challenged by Petitioner in this proceeding." *Id.* Patent Owner also lists several companies that actually did license Patent Owner's technology, and contends that this is "evidence of industry-wide respect for the patented technology." *Id.* at 51 (citing Ex. 2015 ¶ 129).

Patent Owner cites several articles that show it is an "industry leader in developing dual-camera designs and software technologies to power them." *Id.* at 52.

Patent Owner asserts that the failure of others and "[t]he evidence of Petitioner's copying of the '942 patent's technologies from Patent Owner also supports [the] conclusion" of nonobviousness. *Id.* at 54 (citing Ex. 2015 ¶ 134). Patent Owner presents arguments with respect to the failure of Golan and Border inventors to achieve what is disclosed by the '942 patent. *Id.* at 40–41. Patent Owner also asserts: "That Petitioner copied the invention of the '942 patent (among other Corephotonics technologies, which Petitioner also appears to have copied) is strongly implied by the course of conduct between the parties and the timing of Petitioner's announcement of their own version of 'smooth transition' in their iPhone 7 series in Fall of 2016." *Id.* at 56–57 (citing Ex. 2015 ¶ 139).

h) Analysis of Patent Owner's Evidence of Secondary Considerations

Objective indicia of nonobviousness (also referred to as secondary considerations) may include long-felt but unsolved need, failure of others,

unexpected results, commercial success, copying, licensing, industry praise, and expert skepticism. *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1379 (Fed. Cir. 2012). Objective indicia are "only relevant to the obviousness inquiry 'if there is a nexus between the claimed invention and the [objective indicia of nonobviousness].'" *In re Affinity Labs of Tex., LLC*, 856 F.3d 883, 901 (Fed. Cir. 2017) (quoting *Ormco Corp. v. Align Tech., Inc.*, 463 F.3d 1299, 1312 (Fed. Cir. 2006)); *see also ClassCo, Inc. v. Apple, Inc.*, 838 F.3d 1214, 1220 (Fed. Cir. 2016). As the Federal Circuit explained, "a patentee is entitled to a rebuttable presumption of nexus between the asserted evidence of secondary considerations and a patent claim if the patentee shows that the asserted evidence is tied to a specific product and that the product 'is the invention disclosed and claimed.'" *Fox Factory, Inc. v. SRAM, LLC*, 944 F.3d 1366, 1373 (Fed. Cir. 2019), *cert. denied*, 141 S. Ct. 373 (2020) (quoting *Demaco Corp. v. F. Von Langsdorff Licensing Ltd.*, 851 F.2d 1387, 1392 (Fed. Cir. 1988)). That is, presuming nexus is appropriate "when the patentee shows that the asserted objective evidence is tied to a specific product and that product 'embodies the claimed features, and is coextensive with them.'" *Id.* (*quoting Polaris Indus., Inc. v. Arctic Cat, Inc.*, 882 F.3d 1056, 1072 (Fed. Cir. 2018)). On the other hand, the patentee is not entitled to a presumption of nexus if the patented invention is only a component of a commercially successful machine or process. *Id.* (reaffirming the importance of the "coextensiveness" requirement).

Applying *Fox Factory*, the Board uses a two-step analysis in evaluating nexus between the claimed invention and the evidence of secondary considerations. *Lectrosonics, Inc. v. Zaxcom, Inc.*, IPR2018-01129, Paper 33 at 33 (PTAB Jan. 24, 2020) (precedential). We first

consider whether a patent owner has demonstrated "that its products are coextensive (or nearly coextensive) with the challenged claims," resulting in a rebuttable presumption of nexus. *Id.* at 33. If not, that "does not end the inquiry into secondary considerations"; "the patent owner is still afforded an opportunity to prove nexus by showing that the evidence of secondary considerations is the 'direct result of the unique characteristics of the claimed invention.'" *Id.* (quoting *Fox Factory*, 944 F.3d at 1373–75). Once a patent owner has presented a prima facie case of nexus, the burden of coming forward with evidence in rebuttal shifts to the challenger to adduce evidence showing that the objective indicia was due to extraneous factors other than the patented invention. *Demaco*, 851 F.2d at 1392–93

With regard to the first step of an analysis under *Fox Factory*, Patent Owner's evidence of secondary considerations is not tied to a specific product or technology that is disclosed and claimed in the '942 patent, for the reasons discussed below. *See* Pet. Reply 20 (citing *Fox Factory*, 944 F.3d at 1374)).

Patent Owner presents evidence of secondary considerations purporting to address at least: industry praise and licensing; commercial success; and failure of others and copying.

According to one of the emails submitted by Patent Owner, licensing negotiations with Petitioner involved not only the '942 patent, but all patents in Patent Owner's intellectual property portfolio. *See* PO Resp. 50; Ex. 2010 (email chain between Corephotonics and Apple discussing an "option to license all of Corephotonics IP"). In the licensing context, the relevant inquiry is whether there is a nexus between the patent and the licensing activity itself, such that the factfinder can infer that the licensing "arose out

of recognition and acceptance of the subject matter claimed" in the patent. *In re GPAC Inc.*, 57 F.3d 1573, 1580 (Fed. Cir. 1995). To the extent that negotiations with Petitioner or any other licensee (*see* PO Resp. 51 (listing entities that have taken a license from Patent Owner)) were specific to the smooth transition technology Patent Owner mentions, Petitioner argues that Patent Owner "improperly seeks to conflate any use of the term 'smooth transition technology' with the '942 patent's 'reduce an image jump effect . . . by shifting . . . according to a distance.'" Pet. Reply 21 (citing PO Resp. 1, 47, 50, 54, 56–57). Petitioner further argues that Patent Owner "fails to even discuss, let alone prove, whether any usage of 'smooth transition' is actually a reference to the *claimed* technique or merely *unclaimed* techniques described as 'smooth transition' in the '942 patent." *Id.* Petitioner has the better position for the reasons discussed below.

> In the '942 patent,
>
> > [a] "smooth transition" is a transition between cameras or POVs that minimizes the jump effect. This may include matching the position, scale, brightness and color of the output image before and after the transition. However, an entire image position matching between the sub-camera outputs is in many cases impossible, because parallax causes the position shift to be dependent on the object distance. Therefore, in a smooth transition as disclosed herein, the position matching is achieved only in the ROI region while scale brightness and color are matched for the entire output image area.

Ex. 1001, 10:41–51. At its broadest, "[a] 'smooth transition' "minimizes the jump effect," and as disclosed in the '942 patent, this encompasses position matching "only in the ROI region" and "scale brightness and color are matched for the entire output image area." *See id.* In other patents in the continuity chain of the '942 patent, "smooth transition" is similarly defined.

But this disclosure does not appear to address how the position matching is carried out so as to be "according to a distance to an object," as required by independent claim 1 of the '942 patent. That is, independent claim 1 recites a more specific invention than "smooth transition" as it is broadly defined in the '942 patent.

As Patent Owner discloses "smooth transition" in multiple patents, it is not clear which inventions that technology encompasses, based on the complete record developed at trial. Patent Owner's arguments, too, appear to imply that the inventions disclosed in more than one patent are encompassed by smooth transition technology. *See* PO Resp. 50–51. Patent Owner's declarant, Dr. Saber, testifies that "reduction of the 'image jump effect' in zoom when switching between image sensors, has been referred to by Patent Owner as Corephotonics's 'smooth transition' or '[smooth] zoom' technology." Ex. 2015 ¶ 124. With respect to the '942 patent specifically, Dr. Saber testifies that its "central innovation" is the "reduction of the image discontinuity in video output seen when a multi-aperture camera switches from one sensor to another during the zooming process *according to a distance of an object in a region of interest in the images*." *Id.* ¶ 136 (emphasis added). Both Dr. Saber's characterization of the '942 patent's "central innovation" and the recitations of claim 1 are more particular than Patent Owner's "smooth transition" technology as it is defined in the specification. Patent Owner's evidence of industry-wide praise and licensing, commercial success, as well as failure of others and copying is tied to, at its most specific, Patent Owner's smooth transition technology, which is broader than the invention recited in claim 1 of the '942 patent.

For example, as evidence of licensing negotiations, Patent Owner submits Exhibits 2011 and 2012 discuss "Corephotonic's technologies and intellectual property, including 'software that fuses wide angle and telephoto video together,' 'sensor synchronization,' 'MIPI signaling and image processing requirements,' and "image registration in GPU…'." Not only are these areas of technology not limited to the invention recited in claim 1, it is not entirely clear how they even relate to it. Exhibit 2007 is an email chain discussing "a number of eleven 'top level deliverables'." Those top level deliverables do not concern the invention recited in claim 1. Exhibit 2008 concerns "Corephotonic's smooth transition technology" and "ongoing technical discussions" between Petitioner and Patent Owner. For the reasons discussed above, evidence tied to Corephotonic's smooth transition technology is not coextensive with the invention recited in claim 1 of the '942 patent. Patent Ownder does not show that it has a product that embodies independent claim 1.

As industry praise, Patent Owner cites several articles that praise it for being a "leader in multi-camera technology," "world-renowned leader in the mobile imaging space," a "leading supplier" and a "'key player' in the computational photography market." PO Resp. 52. The praise is for Corephotonics as a company, not the specific invention recited in claim 1 of the '942 patent. Similarly, Patent Owner's evidence of commercial success, which includes articles in Forbes.com, Globes.co.il, and Engadget.com concerning Samsung's purchase of Corephotonics, does not specifically address the invention recited in claim 1. *Id.* at 53.

As evidence of failure of others, Patent Owner argues that Golan failed to "recognize the problem of discontinuities due to parallax which are

present in such switching or the use of the position matching techniques and image registration techniques discussed in the '942 patent." *Id.* at 55. Patent Owner also argues that Border failed to "recognize the need for a 'continuous' zoom or 'smooth transition' between sensors or, "the need to 'reduce an image jump effect.'" *Id.* at 56 (citing Ex. 2015 ¶¶ 137, 138). Patent Owner, however, cites no failed attempts by Golan or Border to achieve the claimed invention. Patent Owner merely notes that they did not disclose the claimed invention, which does not mean that either Golan or Border unsuccessfully attempted to reach the invention of claim 1.

We do not consider Golan's and Border's lack of disclosure on this specific problem, even if it is a failure to recognize the problem, sufficient evidence of failure of others to solve the problem. Failure of other requires "that, notwithstanding knowledge of the references, the art *tried and failed* to solve the problem." *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1338 (Fed. Cir. 2016), *overruled on other grounds by Aqua Prod., Inc. v. Matal*, 872 F.3d 1290 (Fed. Cir. 2017) (emphasis added). Nevertheless, even if the argument is relevant, neither reference has been shown to support failure of others.

For the reasons discussed above, the evidence presented is not sufficiently tied to, or coextensive with the invention of claim 1 in the '942 patent in particular. We further determine that, presenting evidence that is tied to "smooth transition" instead of the invention recited in claim 1 as Patent Owner does, does not establish that any of the evidence is coextensive with the invention recited in claim 1 of the '942 patent.

In view of step 1 of the analysis under *Fox Factory*, we move to step 2 and determine whether Patent Owner's evidence of secondary considerations

is "the direct result of the unique characteristics of the claimed invention." *Fox Factory*, 944 F.3d at 1373–75. Patent Owner is not entitled to a presumption of nexus where the relevant product embodies at least two patented inventions, and the burden remains on Patent Owner to show that the claimed secondary considerations were due to the invention claimed in the patent at issue here. *See Therasense, Inc. v. Becton, Dickinson and Co.*, 593 F.3d. 1289, 1299 (Fed. Cir. 2010). Applying *Therasense*, the Federal Circuit recently explained that allowing a presumption in such a situation would not be "consistent with *Demaco's* explanation that nexus cannot be presumed where, for example, 'the patented invention is only a component of a commercially successful machine or process.'" *See Fox Factory*, 944 F.3d at 1377 (citing *Demaco*, 851 F.2d at 1392) (rejecting a patent owner's "attempt to reduce the coextensiveness requirement to an inquiry into whether the patent claims broadly cover the product that is the subject of the evidence of secondary considerations").

For reasons substantially similar to those discussed, we determine that none of the evidence presented is "the direct result of the unique characteristics of the claimed invention," because Patent Owner's evidence is only as particular as discussing smooth transition technology, which we determine above is broader than and thus, not coextensive with the invention recited in claim 1 of the '942 patent. It is further unclear that any of the industry-wide praise and articles were resulted from the preeminence of the invention recited in claim 1 of the '942 patent.

Because the same evidence of secondary considerations cannot be presumed to be attributable to two or more different features, Patent Owner retains the burden of proving the degree to which the evidence tied to

"smooth transition" technology is attributable to the invention recited in the challenged claims. *Fox Factory*, 944 F.3d at 1378 (citing *Therasense*, 593 F.3d at 1299; *WMS Gaming, Inc. v. Int'l. Game Tech.*, 184 F.3d 1339, 1359 (Fed. Cir. 1999)); *see also Lectrosonics*, Paper 33 at 34–35. Petitioner argues that some of the exact same evidence and arguments have been submitted in IPR2020-00905, IPR2020-00906, IPR2020-00487, IPR2020-00861, IPR2020-00862. Pet. Reply 22. As an example, Patent Owner cites the same evidence in IPR2020-00487 with respect to independent claims 1 and 10 of the '233 patent, despite the fact that claims of the '233 patent recite different inventions from that of the '942 patent in the present proceeding. IPR2020-00487, Paper 16, 30–41.

Independent claim 1 of the '233 patent recites "executing registration between the Wide and Tele images for performing position matching to the video output images when switching from an output of the Tele imaging section to an output of the Wide imaging section or vice versa." Independent claim 10 recites a substantially similar limitation. Neither claim includes a "shifting" limitation that is performed "according to a distance to an object," as in the inventions of claims 1 and 19 of the '942 patent. As in *Fox Factory*, the '942 patent is a continuation of the '233 patent, but the two patents do not cover the same invention. *See Fox Factory*, 944 F.3d at 1377 (rejecting the argument that a presumption should exist where the two patents at issue are related). In this case, the '942 and '233 patents cover different aspects of smooth transition technology.

We are not persuaded that Patent Owner has met its burden to establish a nexus between the merits of the claimed invention and the submitted evidence relating to industry-wide praise and licensing,

commercial success, as well as failure of others and copying. Absent a nexus, we determine that Patent Owner's evidence of objective indicia does not weigh in favor of nonobviousness.

We have reviewed Petitioner's arguments, the supporting testimony provided by Dr. Durand, and the cited portions of Golan and Martin, as well as the supporting evidence and are persuaded that the proposed combination teaches the limitations recited in independent claim 1, as set forth above. Petitioner's rationale for combining Golan and Martin is set forth in Section III.D.3.b, and is determined to be supported by sufficient rational underpinning for at least the reasons set forth above in Section III.D.3.c. For the foregoing reasons, we determine Petitioner establishes unpatentability of independent claim 1 over the proposed combination of Golan and Martin by a preponderance of the evidence.

4. Independent Claim 19

Independent claim 19 recites a method for providing a digital video output in a multiple aperture zoom digital camera similar to that recited in independent claim 1. Ex. 1001, 14:53–15:7.

Petitioner's arguments for independent claim 19 refer, in large part, to its arguments for independent claim 1. *See* Pet. 41–43.

Patent Owner does not present separate arguments for independent claim 19. *See generally* PO Resp. We have reviewed the record including Petitioner's arguments, the cited evidence, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations and find that Petitioner's showing for the limitations that are unique to claim 19 is persuasive. *See id.* at 41–42 (citing Ex. 1003 ¶¶ 132–135). Regarding the remaining limitations, see Section III.D.3 above. *See* Pet. 42–43 (citing Ex.

1003 ¶¶ 136–139). For the foregoing reasons, we are persuaded that Petitioner establishes unpatentability of claim 19 over the proposed combination of Golan and Martin by a preponderance of the evidence.

5. Dependent Claims 2, 4, 20, and 22

Claim 2 recites "wherein the camera controller is further configured, when providing the video output images, to reduce the image jump effect seen in the video output images by matching scale between the Wide and Tele images when switching from the Wide image to the Tele image or vice versa." Claim 20 recites substantially similar features.

Petitioner contends that "Martin's critical alignment teaches matching scale between two parallax images to reduce the image jump effect when switching." Pet. 36 (citing Ex. 1003 ¶ 109). More particularly, Petitioner contends that "Martin describes that, in video images, the successive alternating views of parallax images are manipulated to 'match alignment,' which 'may be represented by an affine transformation including … scaling, and/or any other desired transformation.'" *Id.* at 36–37 (citing Ex. 1006, 4:24–37, 4:56–59, 7:52–53 ("[T]he step of aligning includes at least one of translation, rotation, and scaling."), 5:44–47) (emphasis omitted).

Claim 4 recites, "wherein the switching is between a lower zoom factor (ZF) value and a higher ZF value or vice versa, wherein each Wide image and Tele image has a respective output resolution, wherein at the lower ZF value the output resolution is determined by the Wide sensor and wherein at the higher ZF value the output resolution is determined by the Tele sensor." Claim 22 recites similar features.

Petitioner contends that "Golan teaches switching between Wide image at a lower ZF value and Tele image at a higher ZF value for providing

video output images." Pet. 36. Petitioner further contends that "Golan teaches 'a need for…**a large lossless zooming range**,' therefore, maintaining a same large lossless zoom range, (and that the '**ratio between the image sensor resolution and the output resolution dictates** the lossless electronic zoom range.'" *Id.* at 39 (citing Ex. 1005 ¶¶ 4, 6; Ex. 1005 ¶ 8). As such, "Golan teaches that the output resolution (pixel counts of the output image) is determined by the image sensor resolution to maintain the large lossless zoom range, when image sensors have different configurations (e.g., with different sensor resolutions to configure a frame refresh rate)." *Id.* at 39–40 (citing Ex. 1005 ¶¶ 8, 51–53; Ex. 1009 ¶ 4; Ex. 1003 ¶¶ 121–124). Dr. Durand explains that configurations are changed by "reducing the image frame dimensions (i.e., image sensor resolutions) and decreasing the image acquisition time by the image sensors." Ex. 1003 ¶ 123.

Patent Owner does not present separate arguments for dependent claims 2, 4, 20, and 22. *See generally* PO Resp. We have reviewed the record including Petitioner's arguments, the cited evidence, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations, and we are persuaded that the proposed combination teaches the limitations recited in these claims. For the foregoing reasons, we determine Petitioner establishes unpatentability of claims 2, 4, 20, and 22 over the proposed combination of Golan and Martin by a preponderance of the evidence.

E. Obviousness over Golan, Martin, and Ahiska

1. Overview of Ahiska

Ahiska concerns automatically expanding the zoom capability of a wide-angle video camera. Ex. 1007, 1:17–18. In one embodiment, a wide-angle, master camera is used to capture images and automatically identify an

ROI, and a slave camera can be used to zoom into the identified ROI. *Id.* at 2:55–62. Ahiska's disclosed intent "is to transition between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function." *Id.* at 10:2–5. When view matching with ROI is achieved, "the perspective corrected master camera view is replaced by adjusted slave camera view to achieve an expanded zoom function." *See id.* at 10:15–32.

2. Dependent Claims 3 and 21

Claim 3 recites "wherein the camera controller is further configured, when providing video output images, to match brightness and color between the Wide image and the Tele images when switching from a Wide image to a Tele image or vice versa." Claim 21 recites similar features.

According to Petitioner,

> Ahiska teaches that when switching between a wide-angle master image and a slave image in video output images, matching brightness and color between the images is used to reduce a discontinuous image change for a seamless transition, and as such, discloses using matching brightness and color to "reduce the jump effect seen in video output images" as recited in claim 1 and as construed as discussed at VI.A. Specifically, Ahiska teaches matching "brightness and exposure levels" by equalizing color histograms, and matching color by removing "possible color offsets [] by histogram equalization" between the images for switching to achieve a "transition between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function."

Pet. 46 (citing Ex. 1003 ¶¶ 155–156) (emphases omitted); *see id.* (citing Ex. 1007, 9:44–52, 10:2–5; Ex. 1022 (Jain), 62–66, 241–44). Petitioner contends that "[a] POSITA would have been motivated to incorporate Ahiska's teachings in the combination of Golan and Martin to match

brightness and color between Wide and Tele images to achieve a seamless transition when switching in video output images." *Id.* at 46–47 (citing Ex. 1005 ¶ 36; Ex. 1007, 10:2–5; Ex. 1003 ¶ 157; Ex. 1012 (Scarff), 4:16–26); *see id.* at 47 (citing Ex. 1003 ¶¶ 158, 159).

Ahiska discloses that "master and the slave cameras may have different color settings in practice" and that, "[b]efore performing registration, their color histograms can be equalized so that they both have the same dynamic range, brightness and exposure levels, and possible color offsets are also removed by histogram equalization . . . " Ex. 1007, 9:44–49 (citing Ex. 1022). Ahiska cites "Fundamentals of Digital Image Processing" by Anil K. Jain (Ex. 1022, "Jain") as supporting the disclosure that histogram equalization is "a widely used image processing technique." *Id.* at 9:44–52. In relevant part, a cited portion of Jain discloses that "[h]istogram-modeling techniques modify an image so that its histogram has a desired shape" and is a "powerful technique for image enhancement." Ex. 1022, 241. Ahiska also discloses that "[t]he intention of an example of this embodiment is to transition between the master view and the slave view as seamlessly as possible to create the quality of a continuous zoom function." Ex. 1007, 10:2–5.

In relevant part, the cited portion of U.S. Patent No. 8,553,106 (Ex. 1012, "Scarff") discloses that "separate images captured by separate sensors 14 and 18 can be of similar levels of brightness and contrast," and that by maintaining similar levels of amplification and exposure times, "transitions between these two images will be more acceptable to the user." *Id.* at 4:12–24.

We have reviewed Petitioner's contentions and are persuaded that they are evidenced by at least Jain and Scarff.

Patent Owner does not present separate arguments for dependent claims 3 and 21. *See generally* PO Resp. We have reviewed the record including Petitioner's arguments, the cited evidence including Golan, Martin, and Ahiska, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations and are persuaded the proposed combination of Golan, Martin, and Ahiska teaches the limitations recited in claims 3 and 21. We are further persuaded that Petitioner's rationale for combining Golan, Martin, and Ahiska is supported by sufficient rational underpinning. For the foregoing reasons, we are persuaded Petitioner establishes unpatentability of these claims over the proposed combination of Golan, Martin, and Ahiska by a preponderance of the evidence.

F. Obviousness over Golan, Martin, and Levey

1. Overview of Levey

Levey concerns digital cameras and automatically selecting a photography mode. Ex. 1015 ¶ 2. In Levey, a user can select between different photography modes by "single button activation," instead of interacting with a multi-step menu selection process—this reduces the amount of user input required to select the photography mode. *Id.* ¶ 18.

2. Dependent Claims 5 and 23

Claim 5 recites, "wherein the camera controller includes a user control module for receiving user inputs and a sensor control module for configuring each sensor to acquire the Wide and Tele images based on a user input that

includes a camera mode and the zoom factor." Claim 23 recites similar features.

According to Petitioner,

> [First,] Golan teaches a "zoom selecting control" (a user control module) for receiving user inputs including "a requested zoom" (a zoom factor). Further, Golan's zoom control circuit 130 (sensor control module) configures each sensor to acquire Wide and Tele images, by "select[ing] the relevant image sensor (110 and 112) by activating image sensor selector 150 position," based on a user input zoom factor in video mode.
>
> Second, Levey describes "a photography mode user interface for selecting between a plurality of photography modes," and configuring its image sensor using associated image capture settings.

Pet. 49–50 (citing Ex. 1005, code (57), Figs. 2 and 7, ¶¶ 39, 45–48, 66, claim 1; Ex. 1003 ¶¶ 171–175; Ex. 1015, code (57), ¶¶ 4, 39, 41, 45, 57, 70, 71) (emphases omitted). As one reason for combining Golan, Martin, and Levey, Petitioner contends that

> [C]ombining Levey's teaching of configuring an image sensor based on a user input camera mode (while described using a single image sensor camera) in the dual-aperture digital camera of Golan and Martin would have been no more than the combination of known elements according to known methods (such as providing a user interface for camera mode selection and configuring Wide and Tele sensors based on associated image capture settings) to provide user camera mode selection.

Id. at 48–49 (citing Ex. 1003 ¶¶ 167–168).

A cited portion of Levey discloses that "[m]ost digital cameras have a variety of photography modes that can be selected by the user to control various elements of the image capture process and the image processing chain." Ex. 1015 ¶ 4. Levey further discloses determining "image capture settings such as the exposure index, the lens F/# [F number], the exposure

time and the electronic flash setting, as well as other user settings 175, such as those discussed with reference to FIG. 2," with respect to an automatic mode. *Id.* ¶ 70. As an example, Levey discloses that "[i]f a user is capturing images at a soccer game, they would typically set the camera to operate in a sport photography mode" which "would generally choose appropriate image capture settings to minimize the motion blur associated with moving subjects." *Id.* ¶ 71.

Patent Owner does not present separate arguments for dependent claims 5 and 23. *See generally* PO Resp. We are persuaded that Golan discloses the user control module and the sensor control module in the claimed camera controller, and Levey discloses "configuring each sensor to acquire the Wide and Tele images based on a user input that includes a camera mode and the zoom factor" based on the cited portions of Golan and Levey. We have reviewed the record including Petitioner's arguments, the cited evidence including Golan, Martin, and Levey, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations and we are persuaded the proposed combination of Golan, Martin, and Levey teaches the limitations recited in claims 5 and 23. Further, Petitioner's rationale for combining Levey with Golan and Martin, is supported by sufficient rational underpinning. For the foregoing reasons, Petitioner establishes unpatentability of these claims over the proposed combination of Golan, Martin, and Levey by a preponderance of the evidence.

G. Obviousness over Golan, Martin, and Parulski

1. Overview of Parulski

Parulski concerns "a digital camera that uses multiple lenses and image sensors to provide an improved imaging capability." *See, e.g.*, Ex.

1008, 1:8–10. In one embodiment, an image capture assembly can be a digital camera that includes two image capture stages. *See id.* at 12:36–45. The two image capture stages can be used to separately capture images of the same scene so that one image capture stage can be used for autofocus and other purposes, and the other is used for capturing an image. *Id.* at 8:9–13. This allows for improved imaging capability without unduly increasing the size or cost of the digital camera. *Id.* at 8:13–16. In one example, the image capture assembly can include a fixed focal length wide angle lens and a fixed focal length telephoto lens. *Id.* at 23:28–40. An image processor "may provide digital zooming between the wide angle and the telephoto focal lengths; the user may initiate such zooming via a user interface . . . . " *Id.* at 23:54–56.

2. Dependent Claims 6, 7, 24, and 25

Claim 6 recites "wherein the camera controller is further configured to use, at the higher ZF, secondary information from the Wide imaging section, for providing video output images during switching between a lower ZF value and a higher ZF value to reduce discontinuities in the video output images." Claim 24 recites similar features.

Petitioner contends "Golan teaches providing video output images including switching between a Wide image at a lower ZF value and a Tele image at a higher ZF value." Pet. 56 (citing Ex. 1003 ¶ 189). Petitioner further contends that "Parulski teaches using, at the higher/lower ZF, secondary information from non-primary capture unit (Wide/Tele imaging section respectively), for providing video output images during switching." *Id.* (Ex. 1003 ¶¶ 190–92); *see id.* (citing Ex. 1008, Figs. 8, 16A–B, 15:54–57, 18:25–29, 18:37–38, 18:52–53, 23:28–43). Petitioner annotates

Parulski's Figures 8 and 16B (*see* Pet. 52–53) to demonstrate how Parulski teaches these limitations.

As a rationale for combining, Petitioner contends that one of ordinary skill in the art would have combined Parulski's teachings concerning using "secondary information from non-primary capture unit during switching in the combination of Golan and Martin to achieve the benefit of 'an improved imaging capability in a multi-lens digital camera' including reduced discontinuities when switching." Pet. 54–55 (citing Ex. 1008, 1:7–10; Ex. 1003 ¶¶ 183–191). According to Petitioner, doing so "would have been no more than the combination of known elements according to known methods . . . " *Id.* at 55 (citing Ex. 1003 ¶¶186–187).

In a cited portion, Parulski discloses that its "image processor 50 sets the primary capture unit parameters utilizing the scene analysis data obtained by the scene analysis capture unit (block 1302)." Ex. 1008, 26:18–21. Parulski further discloses that "[s]uch scene analysis data could include without limitation exposure data, dynamic range data, depth of field data, color balance, identification of different aspects of the scene including faces, grass, sunset, snow, etc, and the capture unit parameters could include without limitation aperture value, exposure time, focus position, white balance, ISO setting, etc." *Compare id.* at 25:62–26:1, *with* Ex. 1001, 5:3–6 ("As used herein, 'secondary information' refers to white balance gain, exposure time, analog gain and color correction matrix.").

Patent Owner does not present arguments with respect to dependent claims 6 and 24. *See generally* PO Resp. We have reviewed the record including Petitioner's arguments, the cited evidence including Golan, Martin, and Parulski, Dr. Durand's testimony, and Patent Owner's evidence

of secondary considerations, we are persuaded that the cited portions of Golan and Parulski teach the limitations recited in claims 6 and 24. We are also persuaded that the ordinarily skilled artisan would have combined Golan, Martin, and Parulski to use additional information to further reduce discontinuities when switching zoom factors and as such, that Petitioner's rationale for combining Golan, Martin, and Parulski is supported by sufficient rational underpinning.

Claim 7 recites "wherein the camera controller is further configured to use at the lower ZF, secondary information from the Tele imaging section, for providing video output images during switching between a higher ZF value and a lower ZF value to reduce discontinuities in the video output images." Claim 25 recites similar features. Patent Owner does not present arguments with respect to dependent claims 7 and 25. *See generally* PO Resp.

The analysis set forth above with respect to claims 6 and 24 applies substantially to claims 7 and 25. Further, a cited portion in column 27, lines 10 through 14 of Parulski discloses that ". . . if the requested zoom position is not within the zoom range of the primary capture unit (yes to block 1502), the functions of the capture units are reversed, that is, the current scene analysis and primary capture units are reset to be the primary capture unit and scene analysis capture unit." Thus, Parulski provides sufficient support for secondary information from the Wide imaging section and alternatively, secondary information from the Tele imaging section. *See id.*

Patent Owner does not present arguments with respect to dependent claims 7 and 25. *See generally* PO Resp.

We have reviewed the record including Petitioner's arguments, the cited evidence, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations, we are persuaded that the cited portions of Golan and Parulski in the proposed combination teach the limitations recited in claims 7 and 25. We are also persuaded that the ordinarily skilled artisan would have combined Golan, Martin, and Parulski for the reasons discussed above with respect to claims 6 and 24 and that such rationale is supported by sufficient rational underpinning. For the foregoing reasons, Petitioner establishes unpatentability of claims 6, 7, 24, and 25 over the proposed combination of Golan, Martin, and Parulski by a preponderance of the evidence.

3. Dependent Claim 8

Claim 8 recites, "wherein the Tele lens includes a ratio of total track length (TTL)/effective focal length (EFL) smaller than 1."

Petitioner contends that "[a] POSITA would have understood that Golan's tele lens 120 is a telephoto lens, which by definition, has a telephoto ratio smaller than 1 ('less than unit[y]')." Pet. 61 (citing Ex. 1023, 169; Ex. 1003 ¶ 203). Smith describes the arrangement shown in its Fig. 10.1 as teaching "a compact system with an effective focal length F which is longer than the over length *L* of the lens" and that the "ratio of L/F is called the telephoto ratio, and a lens for which this ratio is less than unity is classified as a telephoto lens." Ex. 1023, 69.

According to Patent Owner, in independent claim 1, "'tele lens' requires a FOV narrower than the 'wide lens,'" "[c]laim 8 adds the requirement that 'the tele lens' in claim 1 further have a ratio of TTL/EFL smaller than one," and "[t]his is strong evidence that for a POSITA 'tele

lens' did not imply TTL/EFL smaller than one." PO Resp. 59 (citing Ex. 2001 ¶ 148; Ex. 1001, 13:28–31). Patent Owner contends that "[t]he specification similarly says: '[i]n some embodiments, the thickness/effective focal length (EFL) ratio of the Tele lens is smaller than about 1'" and that, "[b]y saying 'some embodiments,' this sentence implies that there are other embodiments of the invention where the 'tele lens' does not have a ratio TTL/EFL less than one." *Id.* (citing Ex. 1001, 3:41–43). For these reasons, Patent Owner contends that "[a]t least in the context of the '942 patent, 'tele lens' does not imply TTL/EFL less than one." *Id.* (citing Ex. 2015 ¶ 149).

Patent Owner presents these arguments with respect to Golan, which expressly describes only a narrow FOV for the tele lens, and contends that a narrow FOV would be understood to have a long focal length. *Id.* at 59 (citing Ex. 1003 ¶ 70; Ex. 2015 ¶ 151). Patent Owner presents an equation for FOV angle ($A = 2\theta = 2\ tan^{-1}(\frac{K}{2f})$) from Dr. Durand's First Declaration to support the contention that "it is apparent that when the focal length f increases, the angle A decreases, and vice versa" and as such, "a narrow FOV lens is a long focal length lens, and conversely a wide FOV lens is a short focal length lens." *Id.* at 60. According to Patent Owner, "calling a lens 'narrow FOV,' as Golan calls the tele lens, is the same as calling as calling it 'long focal length' lens, as Smith says the term 'telephoto' is frequently used." *Id.* (citing Ex. 1023, 169).

Patent Owner also points to a presentation given by Dr. Durand to graduate students at MIT. PO Resp. 62 (citing Ex. 2002; Ex. 2014, 55:23–56:24). In that presentation, Patent Owner contends Dr. Durand "explained what a 'telephoto' lens was in terms of the focal lengths of telephoto lenses for 35 mm cameras," which Patent Owner uses to support its contention that

"the term 'telephoto' (and the even less formal 'tele') are commonly used to refer to a range of focal lengths, rather than a ratio of TTL/EFL." *Id.* (citing Ex. 2002, 14–15, 19).

Patent Owner supports its contentions with citations to Smith and Kingslake. Smith discloses that "many camera lenses which are sold as telephoto lenses are simply long-focal-length lenses and are not true telephotos." Ex. 1023, 169. Kingslake discloses that "[s]ome narrow angle lenses are loosely called 'telephoto' lenses because they have a longer focal length than the normal lens and thus give a picture to a larger scale." Ex. 2016, 8–9.

Patent Owner contends that Parulski, being concerned with size, addresses shortening an EFL, but does not teach or suggest reducing the ratio of EFL/TTL to less than one. Patent Owner contends that tele lens or telephoto lens would have been understood to have a narrow FOV, but not to have an EFL/TTL of less than one. PO Resp. 62 (Ex. 2002, 14–15, 19). Patent Owner makes similar arguments with respect to Golan. *See id.* at 63–64.

Petitioner does not respond to Patent Owner's arguments. *See generally* Pet. Reply.

The issue we must decide is whether a POSITA would have understood the EFL/TTL to be less than one in either Golan or Parulski's tele lens. We have what amounts to possibly competing definitions of tele lens or telephoto lens. On the one hand, Smith and Kingslake have a narrower definition for a telephoto lens that requires a narrow FOV and TTL/EFL is less than one. Ex. 1023, 169; Ex. 2016, 8–9. On the other hand, Smith, Kingslake, and Dr. Saber's testimony about Dr. Durand's

presentation to his students indicate that a telephoto lens is sometimes loosely used to refer to lenses with only a narrow FOV or long focal lengths. *See id.*; Ex. 2002; Ex. 2014, 55:23–56:24.

As to Patent Owner's argument regarding the use of the term telephoto in the specification, we do not view the specification's use of the term as dispositive to the issue at hand because the dispute is not a matter of claim construction (i.e., the scope of claim 8 is undisputed), but rather, how a POSITA would have understood that Golan and Parulski used the term. Nevertheless, even regarding how the '942 specification uses the term, Patent Owner does not explain sufficiently what other embodiments purportedly exist in the '942 specification where a tele lens does not have an EFL/TTL less than one. Further, we do not agree that the specification defines a tele lens as being broader than an EFL/TTL less than one. Patent Owner has provided no example of such a definition in the specification.

Patent Owner asserts that "Durand confirmed that this definition of telephoto lenses in terms of their focal length or their FOV (independent of TTL) is how the '*average user*' of lenses 'would mostly think of' telephoto lenses." PO Resp. 62 (citing Ex. 2014, 62:2–15; Ex. 2015 ¶ 155) (emphasis added). Patent Owner also asserts that "when Parulski introduces the concept of 'telephoto lens' it characterizes that lens in terms of FOV, as a *camera user* would, and not in terms of TTL/EFL." *Id.* at 63 (citing Ex. 2015 ¶¶ 156–157).

In the present proceeding, a POSITA is not an "average user" or merely a "camera user;" he or she would have multiple years of experience with at least imaging systems. *Supra* § III.B. Thus, we find that the POSITA would have used the definitions that Smith and Kingslake indicate

are accurate (or more precise), rather than the definitions that Smith and Kingslake indicate are loose or inaccurate (or less precise). We also determine that the prior art, which includes Golan and Parulski, to be reflective of the level of ordinary skill in the art during the relevant timeframe. *Id*. Accordingly, we determine that a POSITA would understand Golan and Parulski to teach a telephoto lens using what Smith and Kingslake teach describe as the more accurate definition for that term. Whether the '942 patent uses the broader definition for that term would not alter Golan's and Parulski's teachings. So a POSITA would understand what Golan and Parluski teach in terms of what the ordinary meaning of the term would be at the time of the invention

Regarding Patent Owner's claim differentiation arguments, here, as discussed above, there is no dispute over the scope of claim 8. Even if the term "tele" lens were to be a given a broader construction due to claim differentiation, the scope of claim 8 would be unaffected. Claim 8 expressly recites that its tele lens has an EFL/TTL of less than one, so giving the term "tele" a broader construction due to claim differentiation would not affect claim 8's scope.[20]

For these reasons, we determine that a POSITA would have understood Golan's and Parulski's tele or telephoto lenses to have a ratio of TTL/EFL that is less than one.

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[20] Further, it would not affect our analysis of claim 1 (the independent claim from which claim 8 depends). Patent Owner does not argue that claim differentiation would affect our analysis of claim 1, and Patent Owner does not assert claim differentiation to support any contention regarding claim 1. Patent Owner also does not dispute that Golan teaches the tele lens recited in claim 1.

We have reviewed Petitioner's arguments, the cited evidence including Golan, Martin, Parulski, and the '942 patent, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations, and we are persuaded the proposed combination of Golan, Martin, and Parulski teaches the limitation recited in claim 8. We are further persuaded that Petitioner's rationale for combining Golan, Martin, and Parulski set forth above with respect to claims 6 and 24 is supported by sufficient rational underpinning for the reasons discussed in Section III.G.2. For the foregoing reasons, Petitioner establishes unpatentability of claim 8 over the proposed combination Golan, Martin, and Parulski by a preponderance of the evidence.

H. Obviousness over Golan, Martin, and Soga

1. Overview of Soga

Soga concerns producing bokeh in an image that is similar to that of an image photographed by a silver halide camera. Ex. 1025, code (57). Soga's device generates a first image focused on a principle subject, and a more wide-angle second image having the same principal subject with a blurred background. *Id.* ¶ 8. The device also "generat[es] a composite image by cutting out the principal subject in the first image and replacing a region of the second image identical to the principal subject cut out from the first image with this principal subject cut out from the first image." *Id.*

2. Claims 9, 12, 13, and 18

Claim 9 recites "wherein the camera controller is further configured to combine, when in still mode, at least some of the Wide and Tele image data

to provide a fused output image." Claim 13 recites a substantially similar limitation.

According to Petitioner, "Soga teaches that when in still mode, combining wider-FOV and narrower-FOV images to provide a composite bokeh image, for example, a still portrait photo 'for a head and shoulder shot.'" Pet. 66 (citing Ex. 1025, Figs. 4A, 4B, 8A, ¶ 84; Ex. 1003 ¶ 220); *see id.* at 64 (citing Ex. 1025 ¶¶ 66–68; Ex. 1003 ¶¶ 212–213).

As rationale for combining Soga with Golan and Martin, Petitioner contends that applying Soga's teachings of bokeh to Golan's dual-aperture camera would reduce image processing complexities because "differences between the two images due to motion of the camera or motion within the scene are avoided," and the "'slow response that is typical of an optical zoom system when traversing a large zoom range' is avoided." Pet. 65 (citing Ex. 1009 ¶ 15; Ex. 1003 ¶ 216). Petitioner also contends that

> Soga's teachings for providing a bokeh image in the system of Golan combined with Martin would have been no more than the combination of known elements according to known methods (such as in still mode, when requested zoom factor is less than a switch zoom factor, configuring Wide and Tele imaging sections to focus at particular distances and generating a composite image by combining Wide and Tele images) to achieve an "aesthetic [] bokeh image" in a still mode, as taught by Soga.

Id. at 65–66 (citing Ex. 1025 ¶ 2; Ex. 1003 ¶ 218). Patent Owner does not present separate arguments for dependent claims 9, 12, 13, and 18.

The cited portion in paragraph 66 of Soga discloses a bokeh image obtained by compositing an image obtained from a first round of photography and an image obtained from a second round of photography in which the focal distance is shorter than the distance to the principle subject,

as Petitioner contends. We are persuaded that Petitioner's rationale for combining the references is sufficiently supported by Border (Ex. 1009), which discloses that, "[b]y forming a composite image with portions of the image from the short focal length lens and portions of the image from the longer focal length lens, perceived image quality is improved" and "complexities in the image processing are reduced." Ex. 1009 ¶ 15.

Claim 12 recites "wherein the camera controller is further configured to provide from the captured images an image with a shallow depth of field." Claim 18 recites "where the shallow depth of field images are suited for portrait photos."

According to Petitioner, "[a] POSITA would have understood that such a fused output image with a focused subject and blurry background has a shallow depth of field effect." Pet. 68 (citing Ex. 1028, 1:19–33; Ex. 1026, 1, 4, Fig. 1A, 1B, 11D; Ex. 1027, 2min10s–2min52s; Ex. 1003 ¶¶ 227–231). Petitioner further contends "Soga teaches that the shallow depth of field images having the bokeh effect are suited a portrait photo 'for a head and shoulder shot.'" *Id.* at 69 (citing Ex. 1025, Fig. 8A, ¶¶ 67, 83); Ex. 1028 (Morgan-Mar), 1:30–33 ("Bokeh is especially important for photos of people, or portraits."); Ex. 1003 ¶ 236). We have reviewed Petitioner's contentions and are persuaded that they are evidenced by at least the cited portions of U.S. Patent No. 8,989,517 (Ex. 1028, "Morgan-Mar").

Patent Owner does not present separate arguments for dependent claims 9, 12, 13, and 18. *See generally* PO Resp.

We have reviewed Petitioner's arguments, the cited evidence including Golan, Martin, and Soga, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations, we are persuaded the

proposed combination of Golan, Martin, and Soga teaches the limitations recited in claims 9, 12, 13, and 18. We are further persuaded that Petitioner's rationale for combining Golan, Martin, and Soga is supported by sufficient rational underpinning. For the foregoing reasons, Petitioner establishes unpatentability of these claims over the proposed combination of Golan, Martin, and Soga by a preponderance of the evidence.

I. Obviousness over Golan, Martin, Soga, and Baer

1. Overview of Baer

Baer concerns low-power CMOS image sensors for stereo imaging. Ex. 1029, 1:49–50. Baer's CMOS image sensors collect an image a line at a time using a rolling shutter. *Id.* at 2:40–41. In one embodiment, the rolling shutters of a pair of CMOS image sensors in a stereo imaging system are synchronized to acquire corresponding lines of images at the same time, so that movement in the image is not confused with depth information. *Id.* at 2:46–49.

2. Dependent Claims 10, 14, and 16

Claim 10 recites "wherein the camera controller is further configured to synchronize the Wide and Tele sensors so that a rolling shutter starts substantially the same time for both sensors." Claims 14 and 16 recite substantially similar limitations.

Petitioner contends that "Baer teaches synchronizing stereo sensors so that a rolling shutter starts substantially the same time for both sensors." Pet. 73 (Ex. 1003 ¶¶ 250–252). According to Petitioner,

> [T]o provide "low-power CMOS image sensors for stereo images," Baer teaches that "the rolling shutters of the pair of CMOS image sensors in a stereo imaging system are

> synchronized to acquire corresponding lines of the images at the same time," which teaches that a rolling shutter starts substantially the same time for both sensors for acquiring corresponding first lines of the images at the same time.

Id. (citing Ex. 1029, 2:46–49, 6:11–15, 5:57–59) (emphases omitted).

Petitioner's contention is supported by the cited portions of Baer, which disclose that "[a] pair of CMOS image sensors is synchronized to acquire line-by-line image data simultaneously." *See* Ex. 1029, 2:45–50. Dr. Durand's testimony (Ex. 1003 ¶ 239) cites a portion of Baer that explains: "CCD images collect an image over the whole image frame at once using a global shutter" and as such, CCD image sensors need only "start acquiring data at the same time and have the same exposure settings." Ex. 1029, 2:34–40. The CMOS image sensors cited by Petitioner differ in that they "collect an image a line at a time using a rolling shutter." *Id.* at 2:40–41. If the rolling shutters of the CMOS image sensors are not synchronized, "corresponding lines in the images will be acquired at different times." *Id.* at 2:41–45.

As rationale for combining, Petitioner contends that

> A POSITA would have been motivated to apply Baer's teachings of sensor synchronization in the digital camera of Golan, Martin, and Soga, such that in the still mode, the Wide and Tele images are captured substantially simultaneously by corresponding CMOS Wide and Tele sensors, for generating a fused output image, which achieves the benefit of reduced complexities in the image processing "since differences between the two images due to motion of the camera or motion within the scene are avoided."

Id. at 73–74 (citing Ex. 1009 ¶ 15; Ex. 1003 ¶ 253). Petitioner sufficiently supports its contention that synchronizing CMOS Wide and Tele sensors, as taught by Baer in combination with Golan, Martin, and Soga, would have

been understood to reduce the complexities of image capture because "differences between the two images due to motion of the camera or motion within the scene are avoided," as explained by Border. *See* Ex. 1009 ¶ 15.

Patent Owner does not present separate arguments for dependent claims 10, 14, and 16. *See generally* PO Resp.

We have reviewed Petitioner's arguments, the cited evidence including Golan, Martin, Soga, and Baer, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations, we are persuaded the proposed combination of Golan, Martin, Soga, and Baer teaches the limitations recited in claims 10, 14, and 16. We are further persuaded that Petitioner's rationale for combining Golan, Martin, Soga, and Baer is supported by sufficient rational underpinning. For the foregoing reasons, Petitioner establishes unpatentability of these claims over the proposed combination of Golan, Martin, Soga, and Baer by a preponderance of the evidence.

J. Obviousness over Golan, Martin, Soga, and Stein

1. Overview of Stein

Stein concerns devices for capturing images in a rolling shutter, stereo image acquisition system that may be included in a vehicle. Ex. 1034, 1:13–15. The imaging system may include image capture devices having fields of view that at least partially overlap. *Id.* at 2:24–27. Stein discloses that by adjusting the image acquisition timing control parameters of each image capture device, it may be possible to ensure that the portions of the image frames of each image capture device corresponding to an overlap region are acquired during the same period of time. *Id.* at 10:27–31.

2. Dependent Claims 11, 15, and 17

Claim 11 recites, "wherein the camera controller is further configured to synchronize the Wide and Tele sensors so that same points of the object in each view are obtained substantially simultaneously." Claims 15 and 17 recited substantially similar subject matter.

Petitioner first addresses Stein's priority date. According to Petitioner, "Stein is entitled to [a] February 7, 2013 priority date, the filing date of Stein Provisional [Provisional Application No. 61/761,724], because 'the disclosure of the provisional application provides support for the claims' of Stein in compliance with §112" and "[a]t least claim 1 of Stein is fully supported by Stein Provisional under §112 as indicated in the claim chart provided by Dr. Durand." Pet. 76 (citing *Dynamic Drinkware*, 800 F.3d at 1381; 35 U.S.C. § 120; Ex. 1003 ¶¶ 260–261).

We have reviewed Dr. Durand's claim chart and are sufficiently persuaded that Stein is entitled to a priority date of February 7, 2013, as Petitioner contends. *See* Ex. 1003 ¶ 261 (citing Ex. 1035, 13–14). Patent Owner does not dispute the priority date accorded to Stein. *See generally* PO Resp.

Petitioner contends that

> Stein's sensors using rolling shutters and are synchronized such that the overlapping fields of view are scanned at the same time. A POSITA would have understood that images with overlapping FOVs captured "during the same time period" is to "synchronize the Wide and Tele sensors so that same points of the object in each view are obtained substantially simultaneously" as recited in the claim.

Pet. 79–80 (citing Ex. 1003 ¶ 273; Ex. 1034, 10:27–31, 10:41–46; Ex. 1035, 13–14). The cited portions of Stein disclose that

> By adjusting the image acquisition timing control parameters of each image capture device, however, it may be possible to ensure that the portions of the image frames of each image capture device corresponding to overlap region 270 are acquired during the same period of time . . . . Generally, the narrower field of view image capture device 120 should have a scan rate at least high enough such that the portions of the image frames from both image capture devices 110 and 120 that correspond to overlap region 270 may be acquired during the same time period.

Ex. 1034, 10:27–31, 10:41–46. We are persuaded that the cited portions of Stein sufficiently support Petitioner's contentions.

As rationale for combining Stein with Golan, Martin, and Soga, Petitioner contends

> A POSITA would have been motivated to apply Stein's teaching of synchronizing sensors having different FOVs so that same points of the object in each view are obtained substantially simultaneously in the system of Golan combined with Martin and Soga to produce the obvious, beneficial, and predictable results of synchronized images with less disparities, which lead to "reduced complexities in the image processing," e.g., in "determining a correspondence of image points" for Wide and Tele images to generate a fused output image in still mode.

Pet. 76–77 (citing Ex. 1034, 14:38–41; Ex. 1009 ¶ 15; Ex. 1003 ¶¶ 262–270). The cited portion in Stein discloses that "[w]here scan lines lack synchronization, disparities in the image data may exist as a result of corresponding scan lines (e.g., in overlap region 270) being captured during different time periods." Ex. 1034, 14:38–41. As discussed above, the cited portion in Border discloses a reduction in the complexities of image capture because "differences between the two images due to motion of the camera or motion within the scene are avoided" when "images from the two image sensors" are captured substantially simultaneously. Ex. 1009 ¶ 15.

Patent Owner does not present separate arguments for dependent claims 11, 15, and 17. *See generally* PO Resp.

We have reviewed Petitioner's arguments, the cited evidence including Golan, Martin, Soga, and Stein, Dr. Durand's testimony, and Patent Owner's evidence of secondary considerations, we are persuaded the proposed combination of Golan, Martin, Soga, and Stein teaches the limitations recited in claims 11, 15, and 17. We are further persuaded that Petitioner's rationale for combining Golan, Martin, Soga, and Stein is supported by sufficient rational underpinning. For the foregoing reasons, Petitioner establishes unpatentability of these claims over the proposed combination Golan, Martin, Soga, and Stein by a preponderance of the evidence.

IV. MOTION TO EXCLUDE

Petitioner objected to Patent Owner's inclusion of Exhibits 2101, 2102, 2103, and 2104 with its Sur-Reply. Paper 30, 1 (citing Ex. 37 C.F.R. § 42.23(b)). Petitioner later filed a Motion to Exclude these exhibits. Paper 36. Patent Owner opposed Petitioner's Motion. Paper 39. Petitioner's Motion to Exclude is dismissed as moot with respect to Exhibits 2101, 2102, and 2103 and denied with respect to Exhibit 2104 because, for the reasons set forth below, our Decision would not be affected by the admission or exclusion of those exhibits.

Exhibit 2101 is an article co-authored by Dr. Duran entitled "Multi-Aperture Photography" and Exhibit 2102 includes dictionary definitions for the term "depend on/upon." Each of these exhibits were provided to Dr. Durand during his June 2, 2021 deposition. Exhibit 2103 is the transcript of the deposition of Dr. Durand held on June 2, 2021 in IPR2020-00487 and

IPR2020-00860. Exhibit 2104 is the transcript of the deposition of Dr. Durand held on June 8, 2021 in IPR2020-00905 and IPR2020-00906.

We do not rely on Exhibits 2101 and 2102 (irrespective of the Motion to Exclude) because they are not cited or discussed in Patent Owner's Sur-Reply with which they were submitted, nor do we rely on the portions of Dr. Durand's deposition testimony that address these exhibits in order to reach the findings and conclusions rendered in this Decision for the following reasons. *See* Mot. 2.

Petitioner seeks to exclude portions of Exhibit 2103 at page 54, line 10 through page 59, line 3 and page 90, line 4 through page 95, line 17 and Patent Owner's Sur-Reply at 8, 25, 26 that discuss Exhibits 2101 and 2102.

With respect to Dr. Durand's testimony at page 54, line 10 through page 59, line 3 of Exhibit 2103—reflecting Dr. Durand's questioning about Exhibit 2101 and whether lens design experience is relevant to the level of ordinary skill in the art for addressing claim 8—we do not reach our conclusion as to the patentability of claim 8 based on revising the level of ordinary skill in the art to additionally include lens design experience. *Supra* § III.G.2. Whether lens design experience should be added to the level of ordinary skill in the art would not affect our conclusion as to claim 8. *Cf.* PO Sur-Reply 17 (citing Ex. 2013, 35:16–39:8).

Dr. Durand's testimony at page 90, line 4 through page 95, line 17 of Exhibit 2103 reflects questioning of Dr. Durand around dictionary definitions for "depending on," which Petitioner uses to propose its responsive construction of the claim term "according to" in the "shifting" limitation. In construing the "shifting" limitation in this Decision, we do not rely on Dr. Durand's testimony on this term because claim construction is a

legal determination that, in this case, does not require us to construe any term of art for which we would look to rely on expert testimony. *See CCS Fitness, Inc. v. Brunswick Corp.,* 288 F.3d 1359, 1368 (Fed. Cir. 2002) (When expert "testimony does not establish the assertion that "member" lacks clear meaning . . . we can resolve the ordinary meaning of the claimed 'member' by resort to the intrinsic evidence and dictionary definitions only. Thus, we do not need to examine expert testimony.").

Petitioner's Motion to Exclude is denied with respect to Exhibit 2104. Petitioner seeks to exclude Exhibit 2104 in its entirety. Exhibit 2104 is Dr. Durand's cross-examination testimony in related proceedings for IPR2020-00905 and IPR2020-00906, which occurred on June 8, 2021, six days after the deposition conducted in the present proceeding. One portion of Exhibit 2104 is submitted in the present proceeding "is offered in this proceeding to show the lack of reliability of Dr. Durand's opinions on secondary considerations of nonobviousness of Patent Owner's inventions because Dr. Durand testified that he had 'never heard of secondary considerations.'" PO Sur-Reply 25–26 (citing Ex. 2104, 14:1–13). We consider Dr. Durand's level of familiarity with the legal concept of objective evidence of secondary considerations to at best affect the weight to be accorded to his testimony regarding a nexus between any product of Patent Owner's and the invention claimed, and more broadly, his testimony with regard to obviousness when evaluating evidence of secondary considerations, not its admissibility.

V. CONCLUSION

We conclude that Petitioner has established unpatentability by a preponderance of the evidence with respect to its challenge to claims 1, 2, 4,

19, 20, and 22 over Golan and Martin, with respect to its challenge to claims 3 and 21 over Golan, Martin, and Ahiska, with respect to its challenge to claims 5 and 23 over Golan, Martin, and Levey, with respect to its challenge to claims 6–8, 24, and 25 over Golan, Martin, and Parulski, with respect to its challenge to its challenge to claims 9, 12, 13, and 19 over Golan, Martin, and Soga, with respect to its challenge to claims 10, 14, and 16 over Golan, Martin, Soga, and Baer, and with respect to its challenge to claims 11, 15, and 17 over Golan, Martin, Soga, and Stein.[21]

Our conclusions regarding the challenged claims are summarized below:

Claims Challenged	35 U.S.C. §	References/ Basis	Claims Shown Unpatentable	Claims Not Shown Unpatentable
1, 2, 4, 19, 20, 22	103(a)	Golan, Martin	1, 2, 4, 19, 20, 22	
3, 21	103(a)	Golan, Martin, Ahiska	3, 21	
5, 23	103(a)	Golan, Martin, Levey	5, 23	

[21] Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 *Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

6–8, 24, 25	103(a)	Golan, Martin, Parulski	6–8, 24, 25	
9, 12, 13, 18	103(a)	Golan, Martin, Soga	9, 12, 13, 18	
10, 14, 16	103(a)	Golan, Martin, Soga, Baer	10, 14, 16	
11, 15, 17	103(a)	Golan, Martin, Soga, Stein	11, 15, 17	
Overall Outcome			1–25	

VI. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that claims 1–25 of the ’942 patent are determined to be unpatentable;

FURTHER ORDERED that Petitioner’s Motion to Exclude is dismissed as moot with respect to Exhibits 2101, 2102, and 2103 and denied with respect to Exhibit 2104; and

FURTHER ORDERED that, because this a Final Written Decision, parties to this proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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